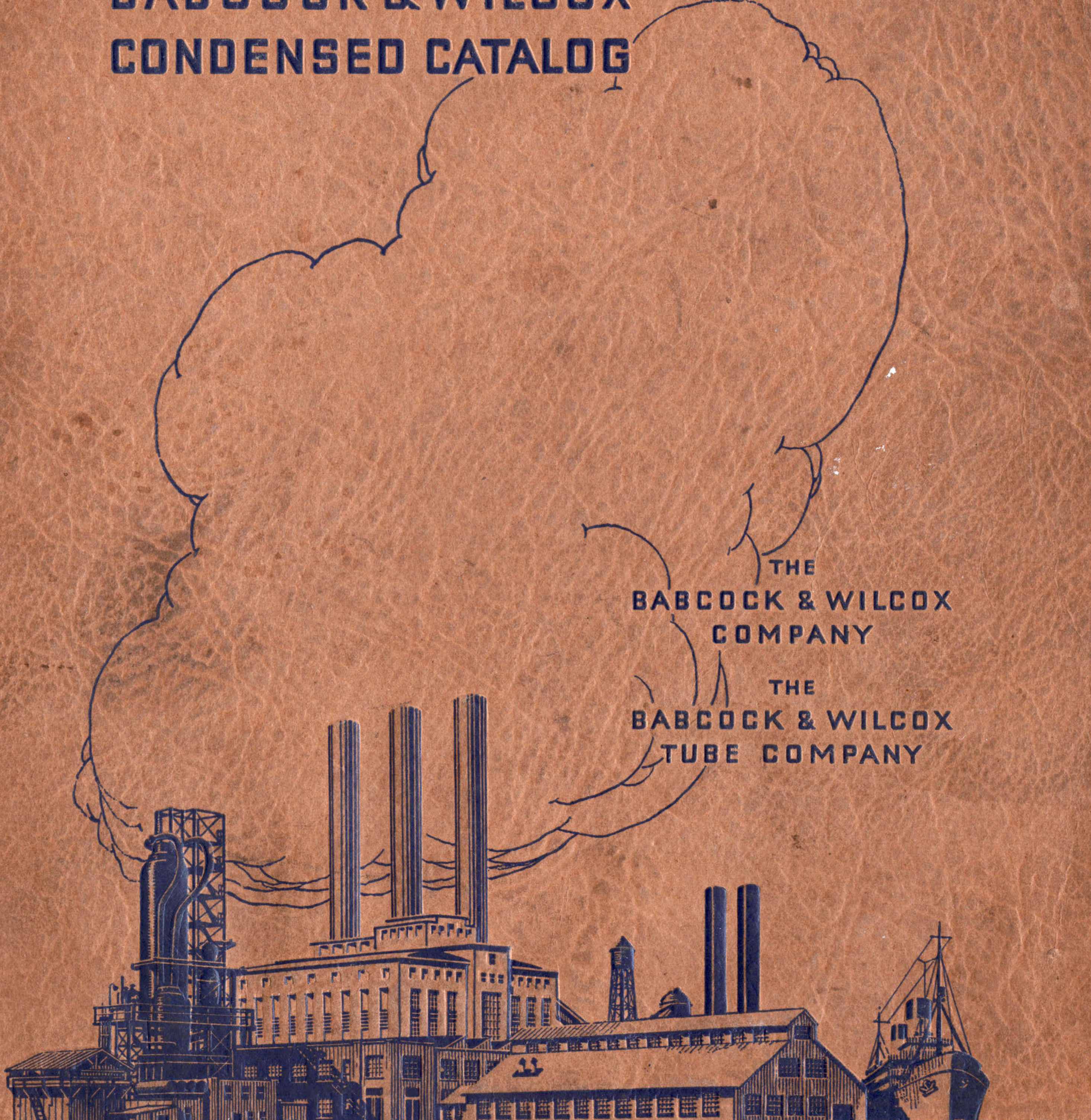
BABCOCK & WILCOX
CONDENSED CATALOG



THE
BABCOCK & WILCOX
COMPANY

THE
BABCOCK & WILCOX
TUBE COMPANY

CONDENSED CATALOG

BULLETIN G 2A

THE BABCOCK & WILCOX COMPANY
85 LIBERTY STREET • NEW YORK, N. Y.

THE BABCOCK & WILCOX TUBE COMPANY
BEAVER FALLS • • • PENNSYLVANIA

A list of branch offices, representatives and works is shown on page 40

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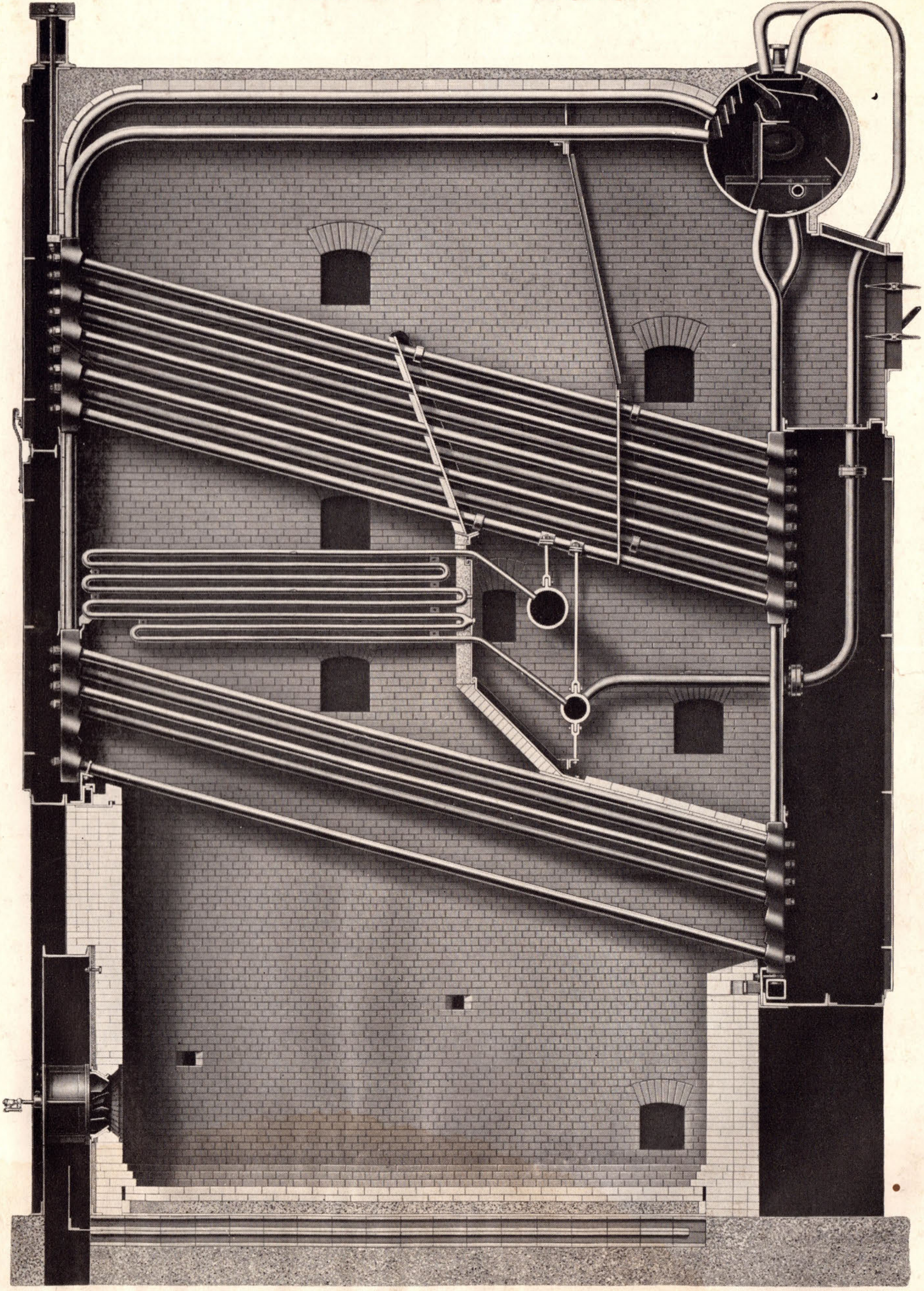
The B & W Boiler

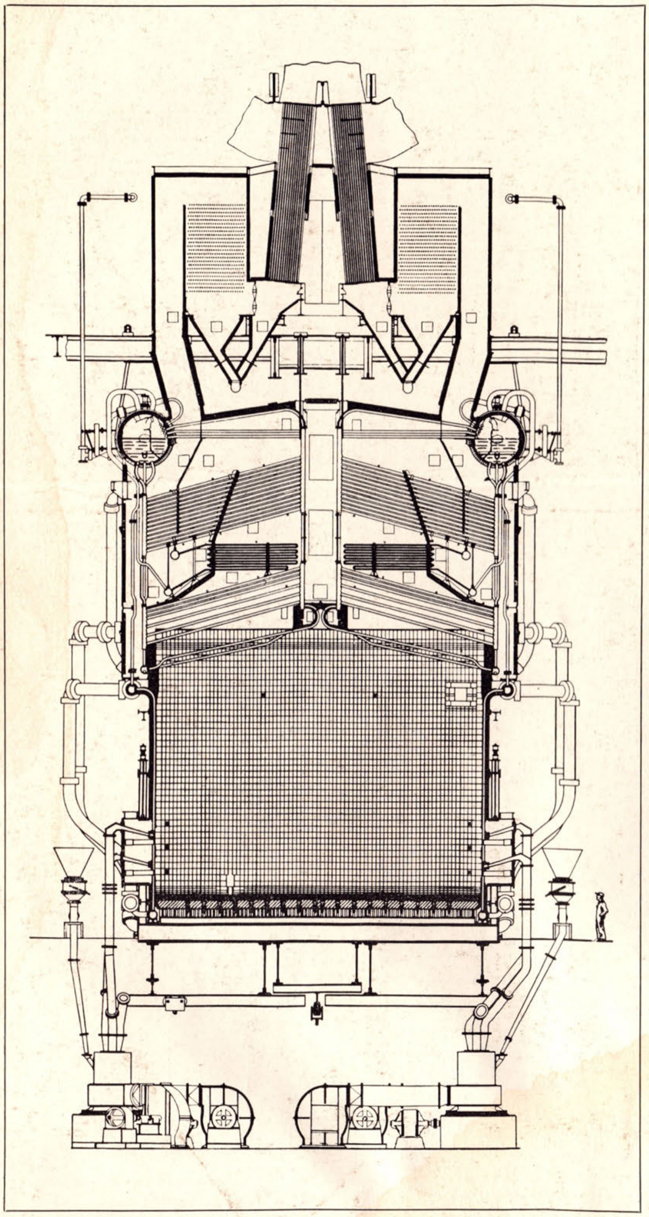


B & W Boiler equipped with Babcock & Wilcox Interdeck Superheater and Mechanical-Atomizing Oil Burners

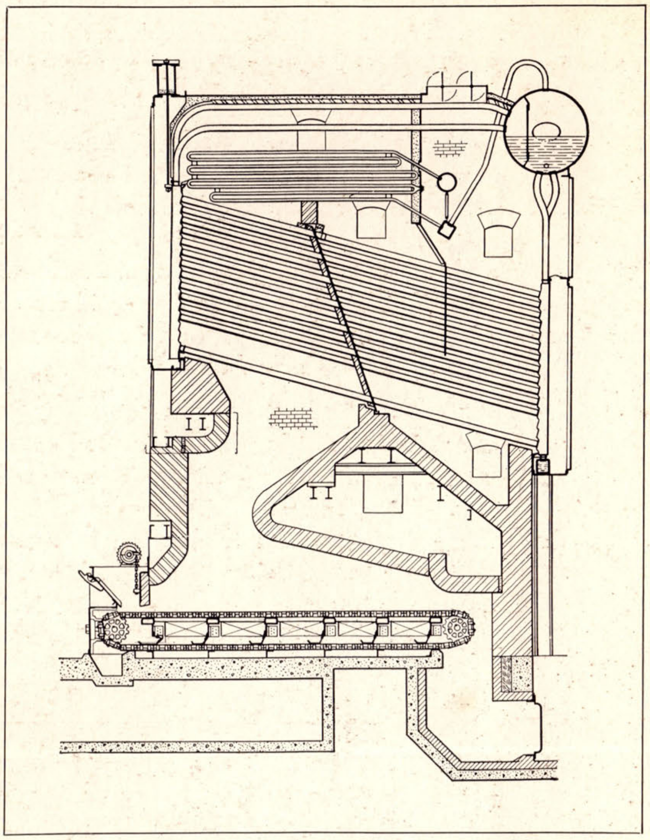
The B & W Boiler

High efficiency, ability to deliver dry steam at high ratings, compactness, flexibility of design, facility of cleaning, and ease of maintenance are important features of the B & W Boiler.

The marked efficiency of this boiler is due to the arrangement and spacing of the tubes and baffles, resulting in uniform distribution of the gases over the heating surface and adjustment of the velocity of the gases to their varying temperature.



Twin B & W Boiler with Babcock & Wilcox Interdeck Superheater, Economizer, Air Heater, and Pulverized-Coal Equipment for Firing a Bailey Water-Cooled Slag-Tap Furnace

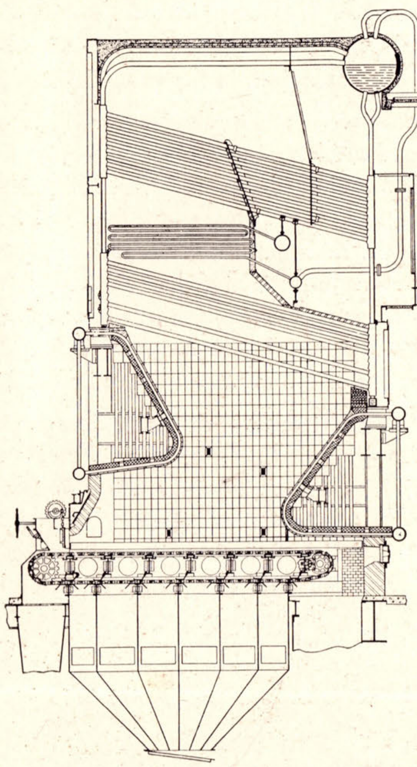


B & W Boiler with Babcock & Wilcox Overdeck Superheater and Chain-Grate Stoker for burning anthracite

The B & W Boiler is noted for its ability to produce dry steam, even when operated at very high ratings, due to positive and rapid circulation throughout the headers and tubes, together with effective separation of steam and water in the drum. Its inherently compact design and ability to operate satisfactorily at high ratings combine to make possible an unusually large steam output for the space occupied.

The principles of design incorporated in the original B & W Boiler more than fifty years ago have existed in each succeeding design of B & W Boiler, which, throughout this long period, has been recognized as the highest standard of water-tube boilers. The design provides great latitude in the width, height, and length of the boiler for various conditions of plant space, fuel, and operating requirements.

The B & W Boiler



B & W Boiler with Babcock & Wilcox Interdeck Superheater, Return-Bend Economizer, Air Heater, and Chain-Grate Stoker for burning bituminous coal

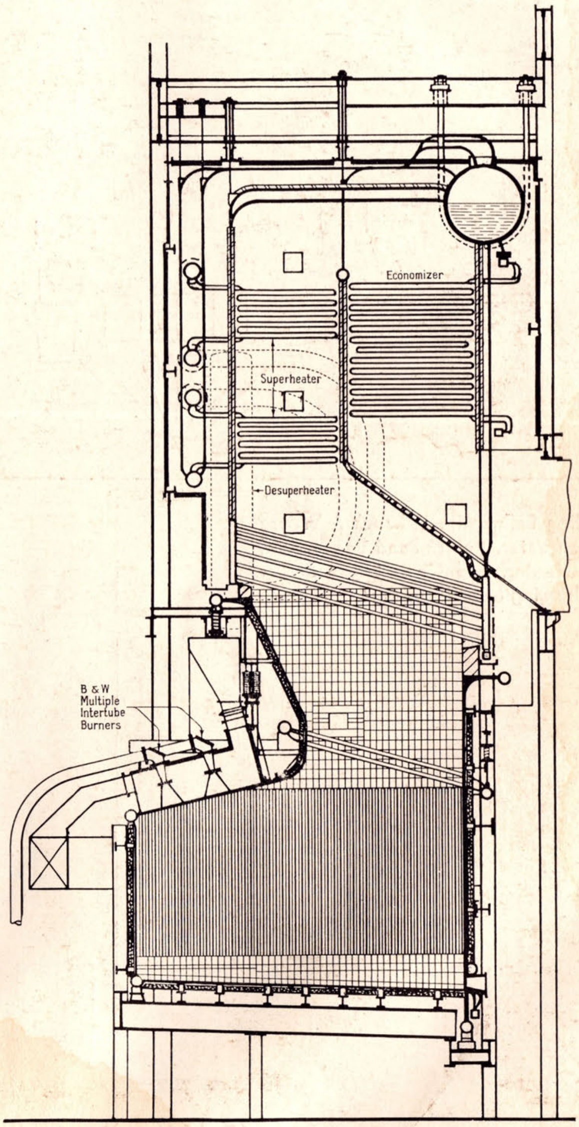
Similarly, where a superheater is required, it can be located in the over-deck position or placed between decks of generating tubes, according to the amount of superheat required. This may be done without altering the path of the gases as they flow through the boiler, or without changing its fundamental design.

A feature of the B & W Boiler which appeals strongly to the operating engineer is the ease and comparative comfort with which it can be cleaned and inspected. Large doors at the front and rear of the casing give access to the header handhole-plates opposite the tube ends, and other doors, conveniently arranged, give access to the heating surfaces.

It is readily adaptable to any kind of fuel and to the various methods of firing.

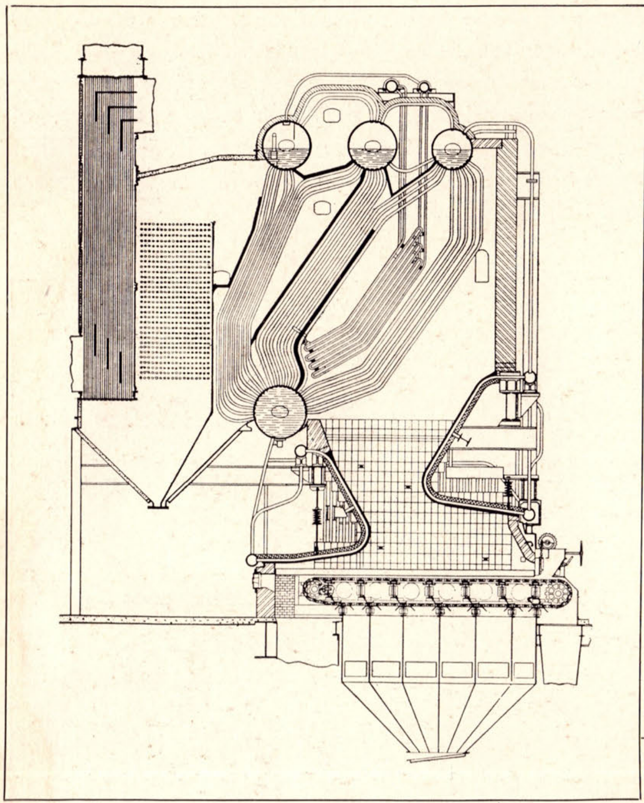
Boilers of this type have been built, for power service, in sizes ranging from a steam output of 1500 pounds per hour up to twin units having a capacity of over 1,000,000 pounds of steam per hour, and for pressures up to 1450 pounds per square inch for power service, and to 2500 pounds per square inch for testing high-pressure fittings.

The wide application of the B & W Boiler and its general acceptance by operators are evidenced by the fact that orders received represent a total heating surface of more than 194,000,000 square feet.



B & W Boiler with Babcock & Wilcox Continuous-Tube Type Superheater, Desuperheater, Continuous-Tube Type Economizer, and Bailey Water-Cooled Slag-Tap Furnace

The Stirling Boiler

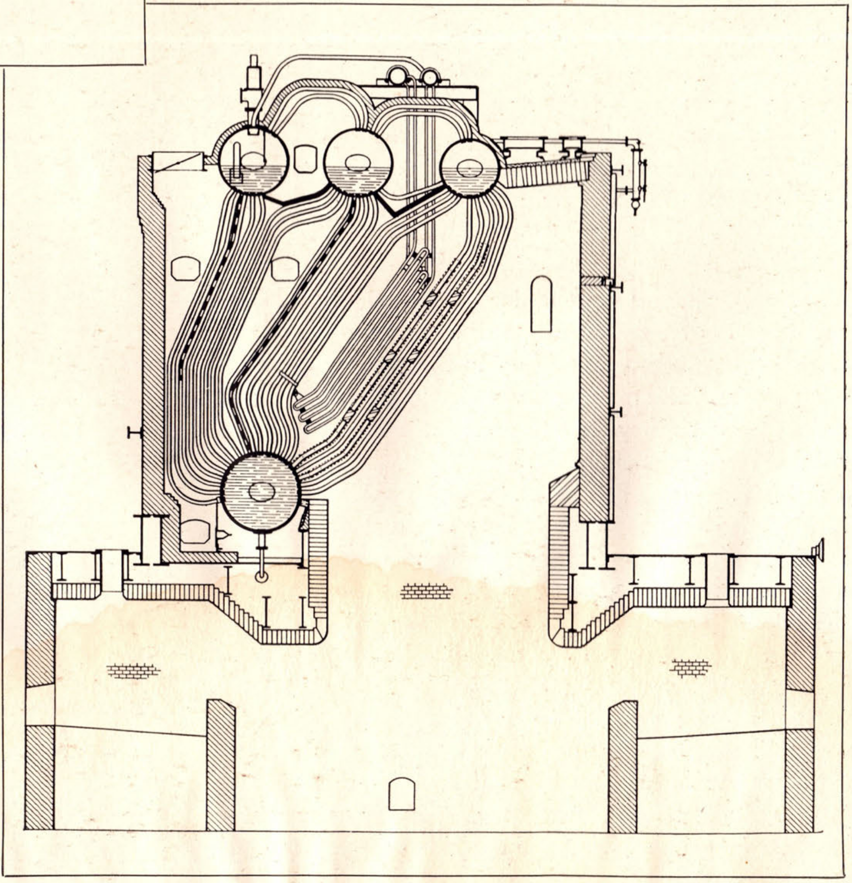


Stirling Boiler with Babcock & Wilcox Superheater, Return-Bend Economizer, Air Heater, and Chain-Grate Stoker for burning bituminous coal

The Stirling Boiler is the result of progressive improvement through more than four decades of extensive research and engineering study, extending from 1888, when the original design was patented, to the present time.

Outstanding characteristics of this boiler are its responsiveness to heavy and sudden demands for steam, and its ability to deliver dry steam under such adverse conditions as operation at relatively high ratings with water of high concentration of solids. These important qualities are due to the large water-storage capacity, the relatively large steam-releasing surface, and the patented arrangement of the steam and water circulators between the upper steam and water drums of the modern Stirling Boiler.

It is built in a number of standard sizes and classes, and has ample space for the installation of a large and well-designed superheater, of a combination radiant and convection type, without substantially increasing the draft loss in the boiler. Any kind of fuel may be used . . . solid, liquid, or gaseous. The number of gas passes can also be



Single-pass Stirling Boiler with Babcock & Wilcox Superheater and extension furnace for burning wood refuse

The Stirling Boiler

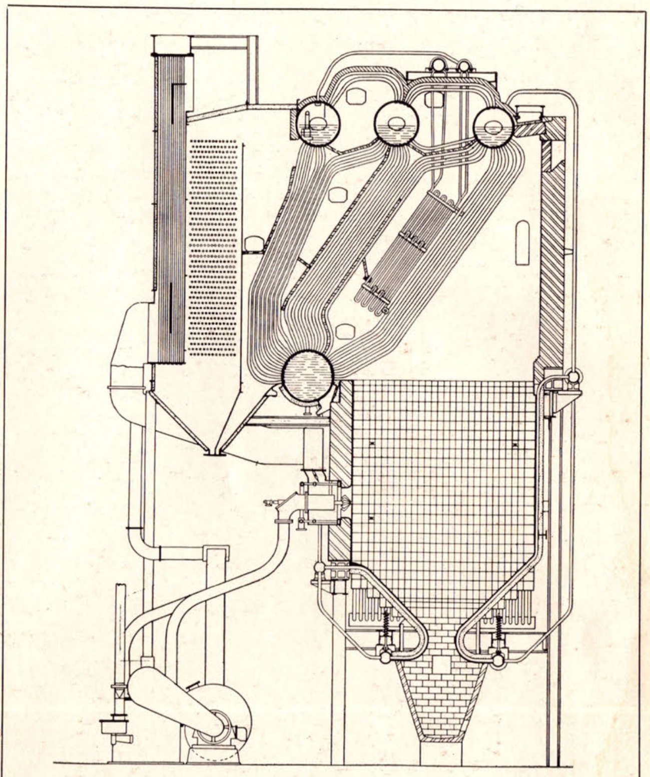
varied to suit the needs of any particular installation, by employing either the well-known three-pass construction, the four-pass arrangement, or the exclusive single-pass design, which is a patented feature of this boiler.

The efficiency of the unit, too, may be varied by the addition of an air heater or economizer, or both; the economizer being available in three types—integral, two-drum, or return-bend.

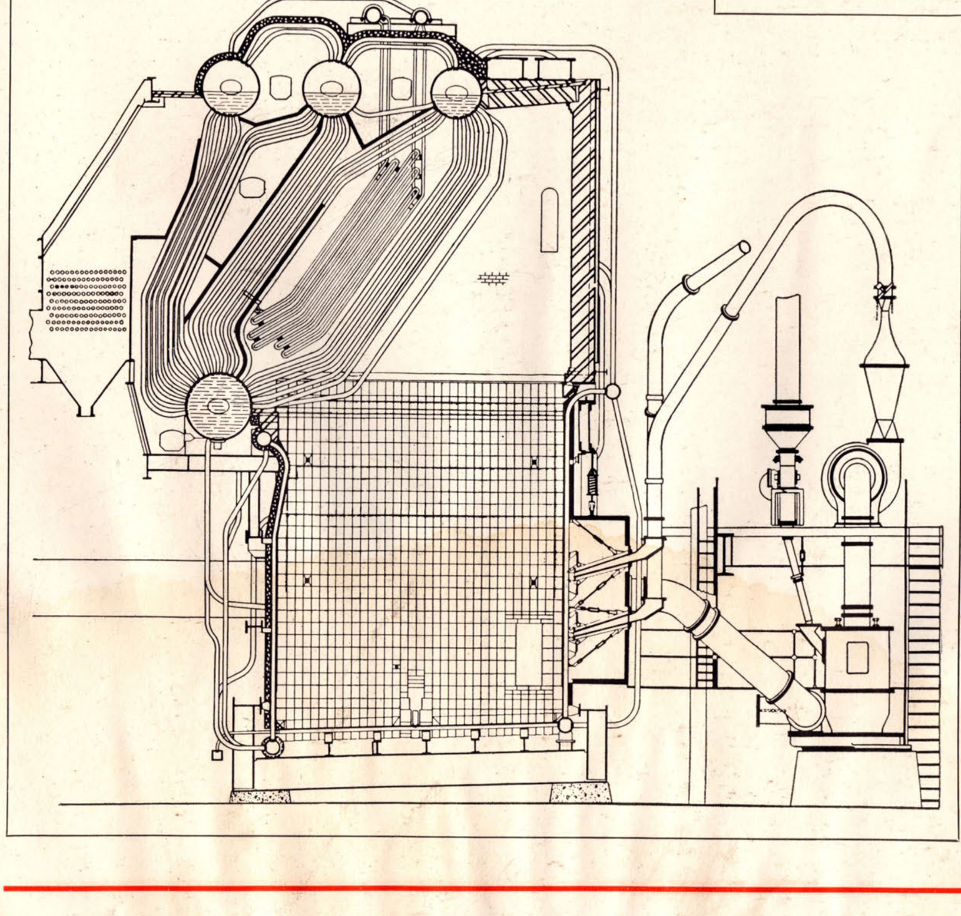
The entire unit is supported independently of the brickwork and is readily accessible for inspection, cleaning, or repair. Any tube may be renewed without disturbing any other tube or the brickwork setting.

This boiler has been built in sizes to deliver as low as 1500 pounds of steam per hour. Twin units can be constructed with a capacity of 1,000,000 or more pounds of steam per hour.

Total heating surface of all Stirling Boilers sold for a wide range of industrial services and for central stations exceeds 87,000,000 square feet.

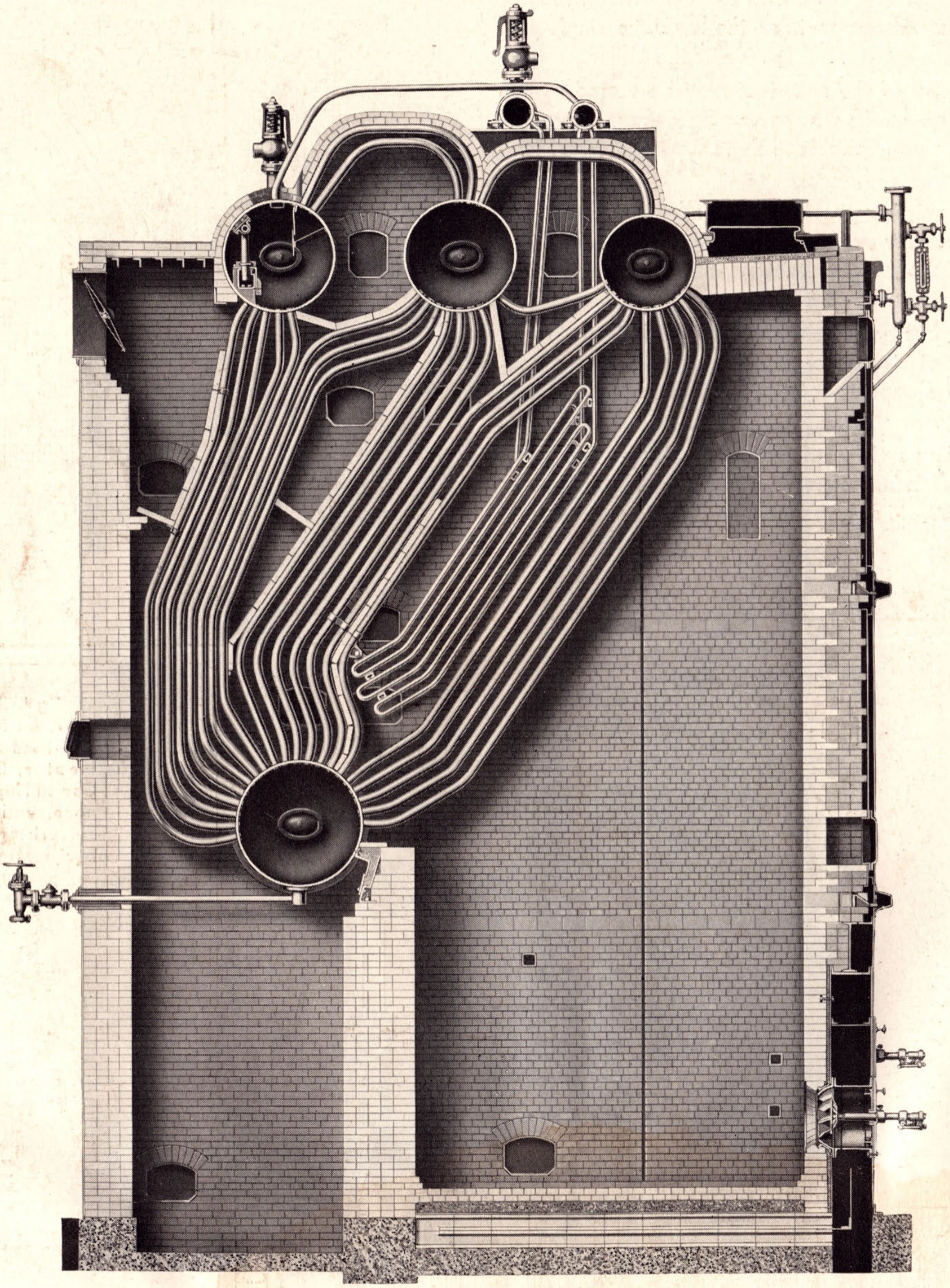


Stirling Boiler with Babcock & Wilcox Superheater, Return-Bend Economizer, Air Heater, Bailey Water-Cooled Hopper-Bottom Furnace, and B & W Coal-Pulverizing and Burning Equipment



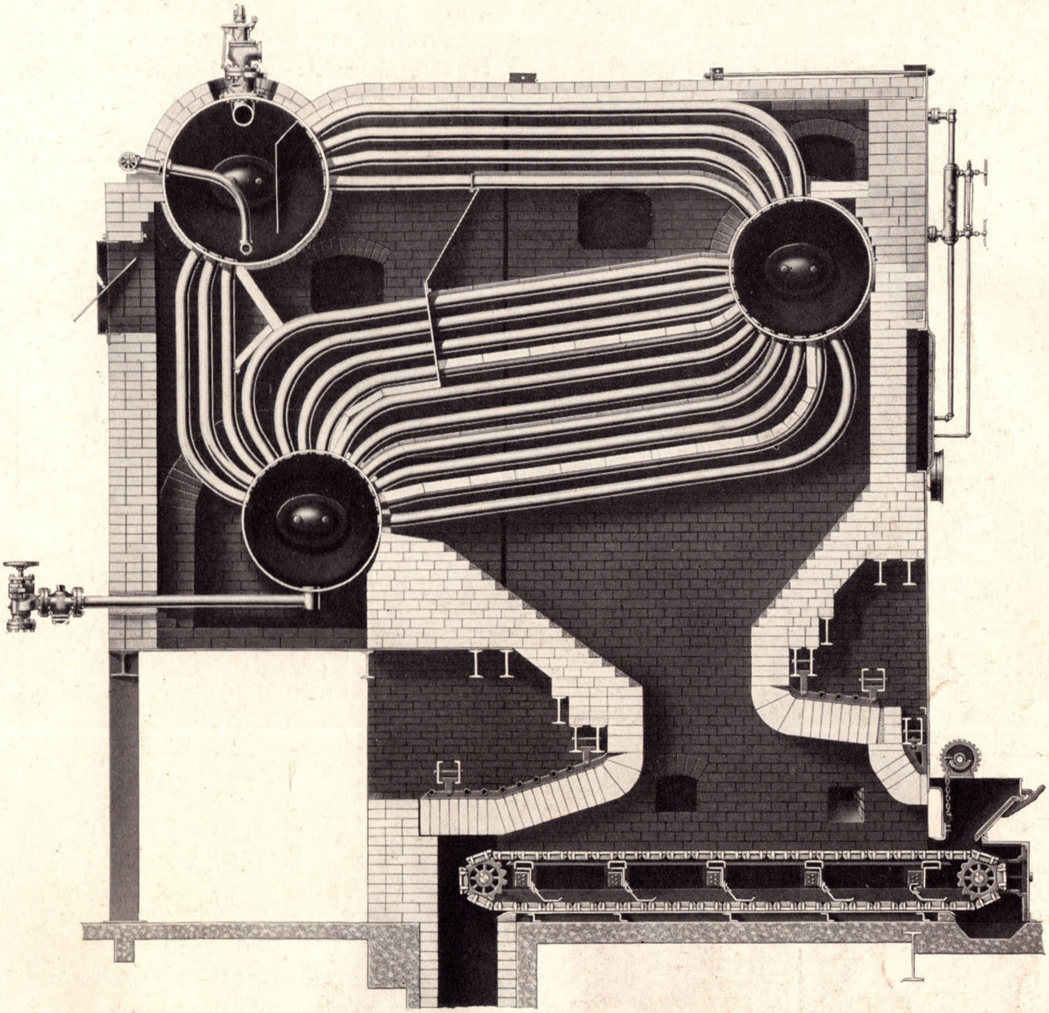
Stirling Boiler with Babcock & Wilcox Superheater, Air Heater, and Pulverized-Coal Equipment for firing Bailey Water-Cooled Slag-Tap Furnace

The Stirling Boiler



Stirling Boiler with Babcock & Wilcox Superheater and Mechanical-Atomizing Oil Burners

The Type H Stirling Boiler



Type H Stirling Boiler with Babcock & Wilcox Chain-Grate Stoker

The Type H Stirling Boiler is a low-head, moderate-pressure unit of simple design, built to the same standards of excellence that have so long been associated with the Babcock & Wilcox name.

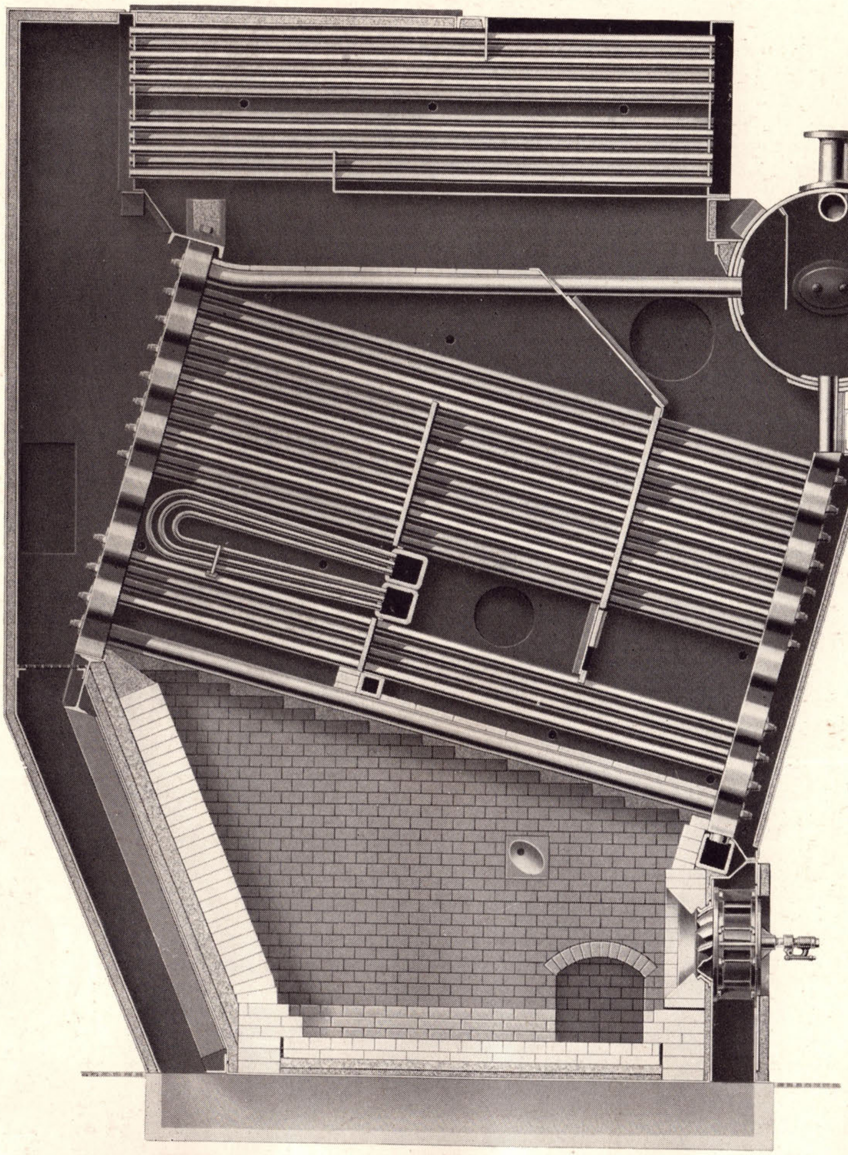
Its adaptability to many classes of service is indicated by the fact that boilers of this type purchased since the early part of 1929 have a total heating surface of over 1,000,000 square feet. It is used in small electric-generating plants, in industrial power plants, for a wide range of process operations, and for heating buildings of practically every class. It is readily adapted to any kind of fuel and any method of firing. Superheaters can be installed in the larger sizes.

Distribution baffles in the form of T-tile installed throughout the length of some of the tubes in the first bank insure the distribution of the gases over this tube area. This very important feature, together with the arrangement of the gas-pass baffles, insures maximum capacity and efficiency of the boiler.

The damper box or gas outlet may be located in any one of three positions, to simplify connection to a stack at either the front or rear of the setting. This is often an important factor in reducing installation costs, as are also the simplicity of the brickwork, the ease with which the supporting framework may be erected, and the fact that many small-size boilers are shipped with all pressure parts assembled.

The Type H Stirling Boiler is built in four classes and 36 sizes having capacities from 1500 to 30,000 pounds of steam per hour.

Marine Boilers



B & W Marine Boiler with Babcock & Wilcox Interdeck Superheater, Air Heater, and Mechanical-Atomizing Oil Burners

For more than forty years, The Babcock & Wilcox Company has held undisputed leadership in the marine industry as designers and builders of water-tube boilers. This leadership is clearly indicated by the fact that the total heating surface of Babcock & Wilcox Water-Tube Boilers ordered to date for steam-propelled vessels of every class and every size, from tugs and tenders to ocean liners and battleships, exceeds 23,000,000 square feet.

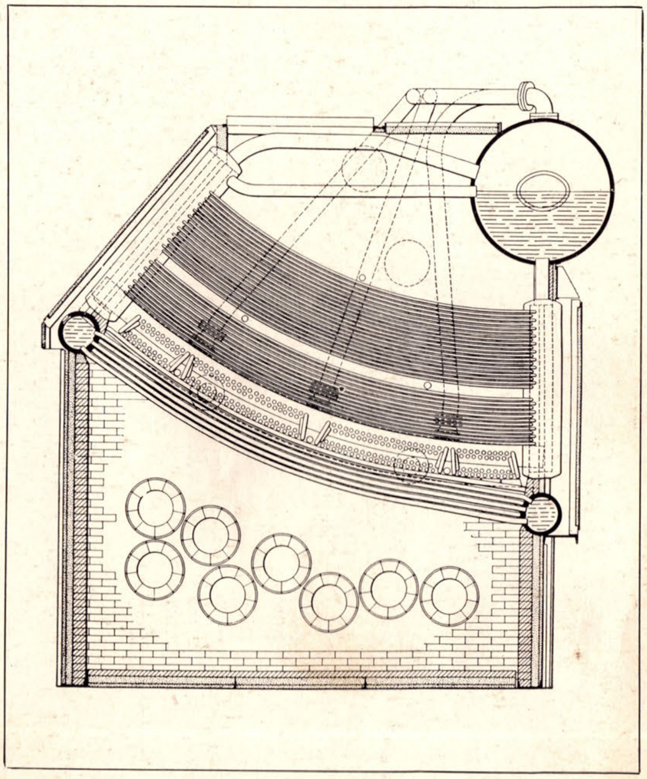
The B & W Marine Boiler is the standard boiler for marine service, because it fulfills the requirements for the efficient, economical, and reliable operation of most ships. It is flexible in design, compact, and readily accessible for inspection and repair. It has been constructed in sizes from 776 to 7807 square feet of heating surface, and can be built for operation at any practicable pressure, and to utilize either oil or coal as fuel, the latter hand-fired, stoker-fired, or in pulverized form.

Marine Boilers

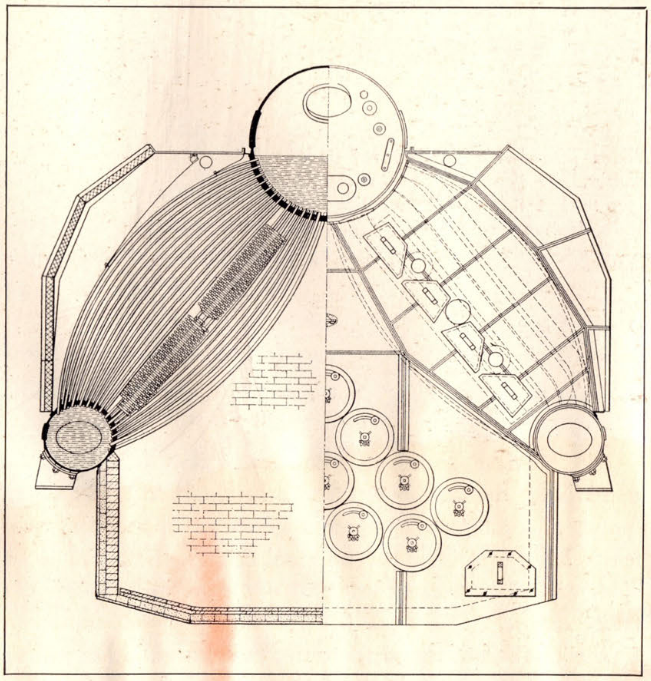
While the B & W Marine Boiler is the most desirable unit for a large majority of ships, it is only one of several designs built by the Company. The Babcock & Wilcox Express-Type Boiler and the Babcock & Wilcox Sectional Express-Type Boiler were developed especially for naval and other services where minimum weight with maximum capacity are required. Other special small-tube boilers have also been designed and built to meet a great variety of unusual operating conditions and arrangements of equipment aboard ship.

Babcock & Wilcox Boilers are used extensively in all classes of Navy and Coast Guard vessels, and in many types of merchant ships. A few of the numerous commercial ships equipped with Babcock & Wilcox Boilers are:

S.S. H. F. Alexander
S.S. St. John and sister ship
S.S. Indiana and three sister ships
S.S. Morro Castle and sister ship
S.Y. Corsair
S.S. Virginia Sinclair and sister ship
Lighthouse Tender Violet and two sister ships
S.S. Borinquen



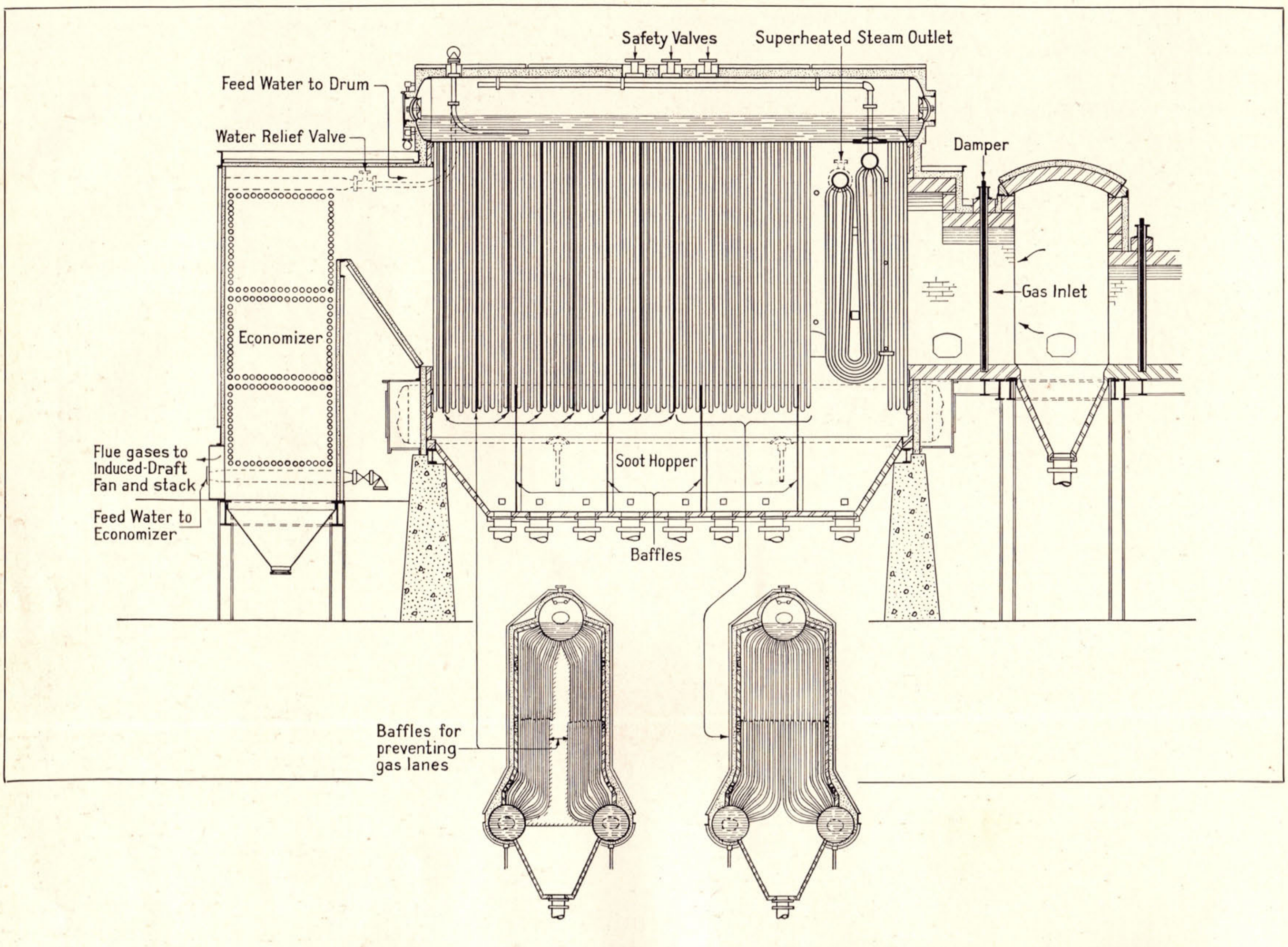
Babcock & Wilcox Sectional Express-Type Boiler



Babcock & Wilcox Express-Type Boiler

S.S. Monarch of Bermuda
S.S. Carl D. Bradley
S.S. Harry B. Williams
S.S. G. Harrison Smith and sister ship
S.S. California and two sister ships
S.S. Manhattan and sister ship
Floating Power Plant Jacona
S.S. Dixie
S.S. Mariposa and two sister ships
S.S. Talamanca and five sister ships
S.S. President Hoover and sister ship
S.S. Exochorda and three sister ships
S.S. Santa Rosa and sister ship
S.S. Santa Clara

Waste-Heat Boilers


Safety Valves
Superheated Steam Outlet
Feed Water to Drum
Water Relief Valve
Damper
Economizer
Gas Inlet
Flue gases to Induced-Draft Fan and stack
Feed Water to Economizer
Soot Hopper
Baffles
Baffles for preventing gas lanes

A typical setting plan of the Babcock & Wilcox Three-Drum Waste-Heat Boiler showing position of superheater and economizer. The two end views show the arrangement of tubes bent closer together in the rear section to decrease the area for gas flow, thus maintaining mass flow and effective heat-transfer conditions

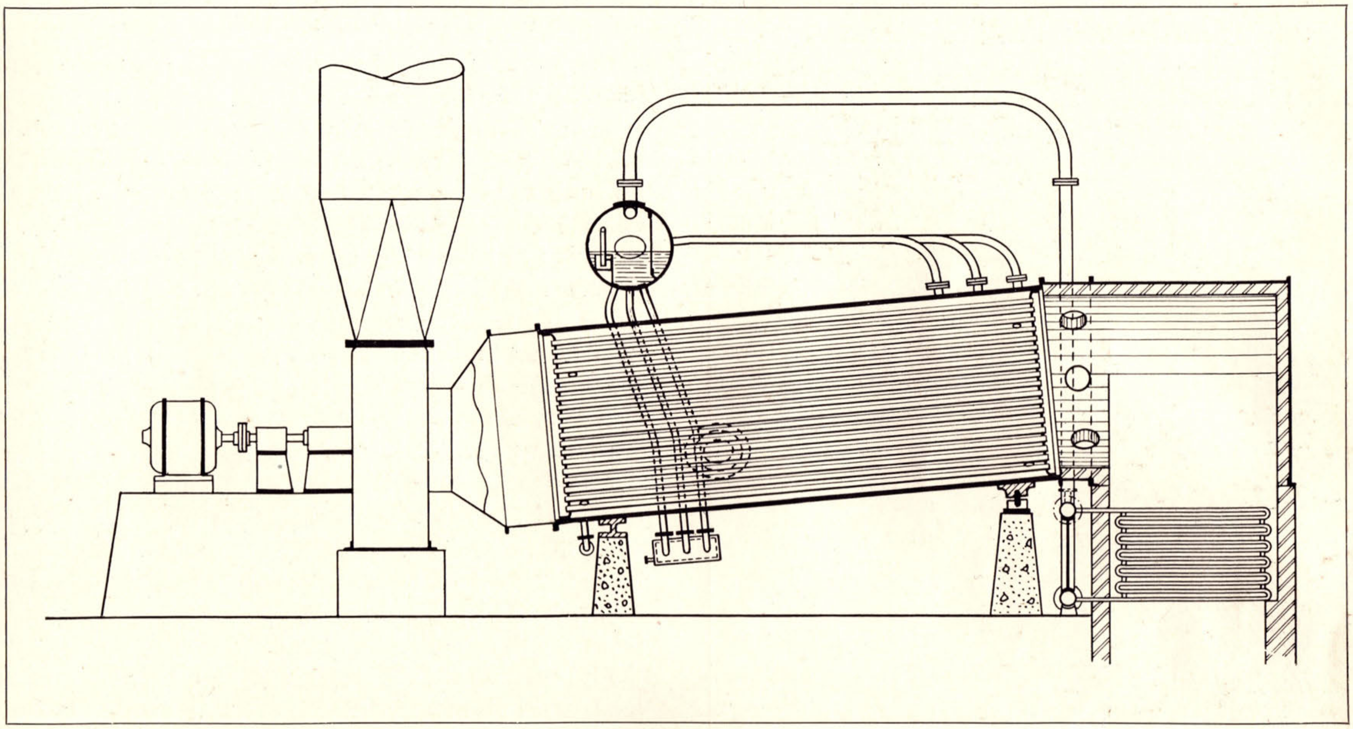
THREE-DRUM BOILER

The boiler shown above is particularly adapted to the utilization of waste heat in gases of high dust content, as maximum precipitation of solids is insured by the horizontal flow of gases through vertical tube-banks and the effective arrangement of baffles. The two lower drums are connected to the upper drum by staggered tubes, which are more closely spaced in the rear sections of the boiler, at right angles to the gas flow, to maintain correct conditions of heat transfer without changing the direction of gas flow, as would be the case were a second pass employed. Steel baffles and baffled sectional-hoppers prevent the gases from short-circuiting and bypassing the tubes.

The most common source of brickwork trouble is eliminated, and air infiltration is reduced to a minimum, because expansion and contraction of the drums and tubes have no effect on the steel casing, firebrick, or insulation. All pressure parts rest upon supports below the lower drums.

The location of the superheater may be varied to secure the degree of superheat required, and the economizer may be of either steel or cast iron. The latter is arranged

Waste-Heat Boilers



Setting plan of the Babcock & Wilcox Gas-Tube Boiler. As the water level is carried in the upper steam-and-water drum, all tubes are submerged and the greatest cause of tube leakage is eliminated

for a downward flow of gases to aid in the precipitation of dust.

FIVE-DRUM BOILER

Maximum heating surface for the required floor area, and exceptionally long travel of the gases over vertical tubes are salient features of the Babcock & Wilcox Five-Drum Waste-Heat Boiler.

The unit consists of three upper and interconnected steam-and-water drums connected to two lower interconnected water drums by three banks of tubes.

The gases enter the lower end of the boiler, under a flat arch, and make three passes in flowing up and down and parallel to the longitudinal axes of the tubes. No drum is exposed to the hottest gases.

The unusual length of tubes prolongs the flow of the gases over the heating surface, and the vertical position of the tubes prevents dust accumulation, further increasing the efficiency of the unit.

If desired, an economizer and a superheater may be added to this boiler.

GAS-TUBE BOILER

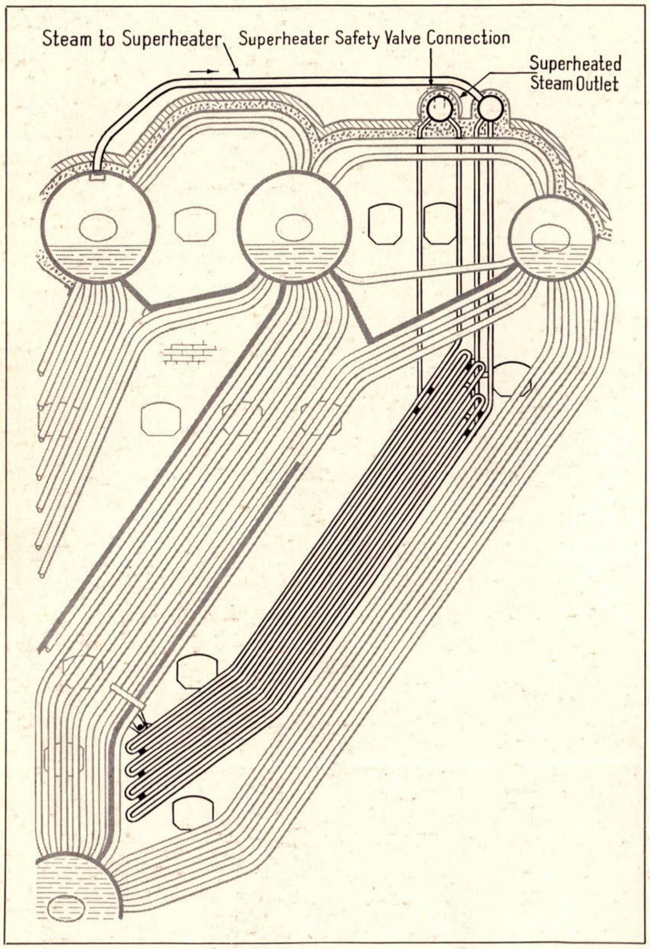
This unit is widely used for the reclamation of waste heat from industrial furnaces, particularly of the open-hearth type. Because the boiler and flues are inherently tight, the unit is well suited to the utilization of heat in gases that, for any reason, should not be allowed to escape from the system except through the stack. The absence of pockets makes this an ideal boiler for operation with many gases of a corrosive nature. The boiler has no refractory lining—an advantage when used with pulsating gases, such as the exhaust from a Diesel engine.

It occupies but little space and may be used for steam pressures up to 750 pounds per square inch, depending upon the size of the boiler.

As all tubes are submerged, the greatest cause of tube leakage is eliminated, the water level being carried in an upper steam-and-water drum which is connected to the gas-tube unit by vertical and horizontal circulators.

As the design does not require the use of staybolts between the tube sheets, the maximum heating surface for a given diameter of drum is easily obtained.

Superheaters, Economizers,


Steam to Superheater
Superheater Safety Valve Connection
Superheated Steam Outlet

Babcock & Wilcox Superheater for Stirling Boiler

SUPERHEATERS

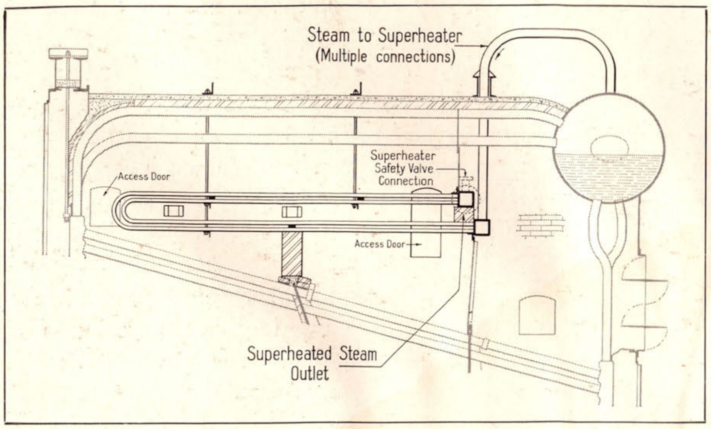
The proper design of superheaters to meet the combined requirements of pressure, temperature, and capacity is an engineering problem intimately associated with that of the boiler and furnace. The experience gained by The Babcock & Wilcox Company, over a period of thirty years, in designing superheaters for a range of conditions as varied as those under which B & W Boilers operate, is therefore of paramount importance. The installation of a boiler and superheater and furnace designed and built by Babcock & Wilcox under one contract obtains for the purchaser undivided responsibility for the satisfactory operation of the unit.

The latest designs of B & W Superheaters assure uniform distribution of steam through the superheater tubes by means of multiple steam connections spaced uniformly along the boiler drum. With these superheaters, the lowest tube temperature, consistent with operating requirements, is obtained with minimum drop in pressure. The tubes are designed to include all the elements governing the temperatures of the metal used; and, when necessary, tubes are made of alloy instead of plain carbon steel.

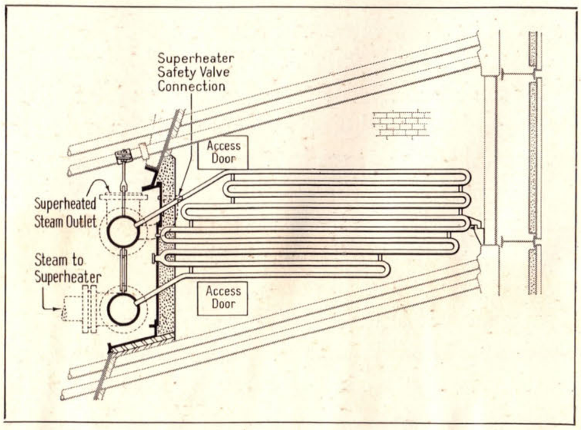
In addition to the superheaters shown herewith, the Company also builds reheat and radiant superheaters, and those of the separately-fired type.

ECONOMIZERS

Since 1915, The Babcock & Wilcox Company has played a leading part in the development of economizers, and introduced the return-bend feature used in the present


Steam to Superheater
(Multiple connections)
Access Door
Superheater Safety Valve Connection
Access Door
Superheated Steam Outlet

Babcock & Wilcox Overdeck Superheater for B & W Cross-Drum Boiler


Superheater Safety Valve Connection
Access Door
Superheated Steam Outlet
Steam to Superheater
Access Door

Babcock & Wilcox Interdeck Superheater for B & W Cross-Drum Boiler

and Air Heaters

standard economizer, and the Steaming Economizer, or forced-flow stage of the B & W Two-Stage Boiler, exclusive B & W Products.

The Babcock & Wilcox Return-Bend Economizer consists of interconnected sections of horizontal, seamless steel tubes so disposed across the path of the hot gases as to assure a maximum rate of heat transfer with minimum resistance to the flow of gases and water. Noteworthy features of design include: minimum return-bend fittings, absence of handholes, elimination of tube sagging, minimum stress at the tube seats, ample allowance for expansion, and gas tightness under all conditions of operation.

The direct-connection of the elements to the boiler drum minimizes the pressure drop and eliminates the necessity for a water relief valve.

This economizer has been built in sizes having 357 to over 31,200 square feet of heating surface, and for working pressures up to 1400 pounds per square inch. Economizers of special design, to meet special conditions of operation, are also built by the Company.

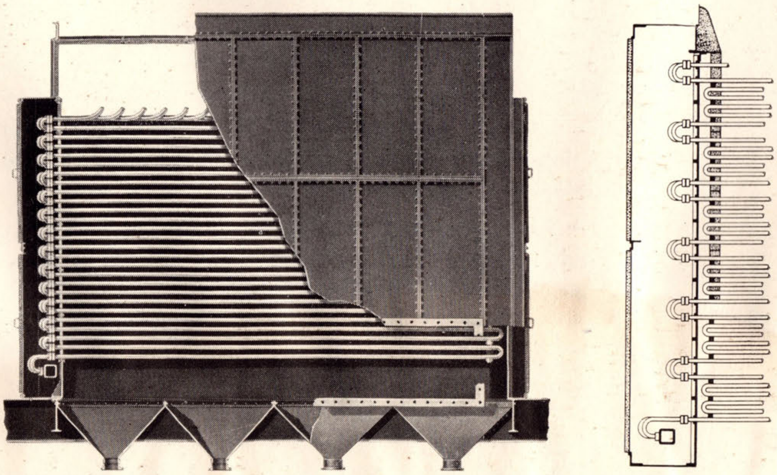
AIR HEATERS

The B & W Tubular Air Heater was designed primarily for pre-heating the air for combustion in power plants, and is admirably adapted for use with boilers fired by any fuel. It consists of a nest of seamless steel tubes expanded into upper and lower tube plates and enclosed in a rectangular steel casing, which serves as the air flue and is provided with inlet and outlet openings for the air and gases. The arrangement of baffles insures an even distribution of air over the entire outside surface of the tubes, with minimum draft loss.

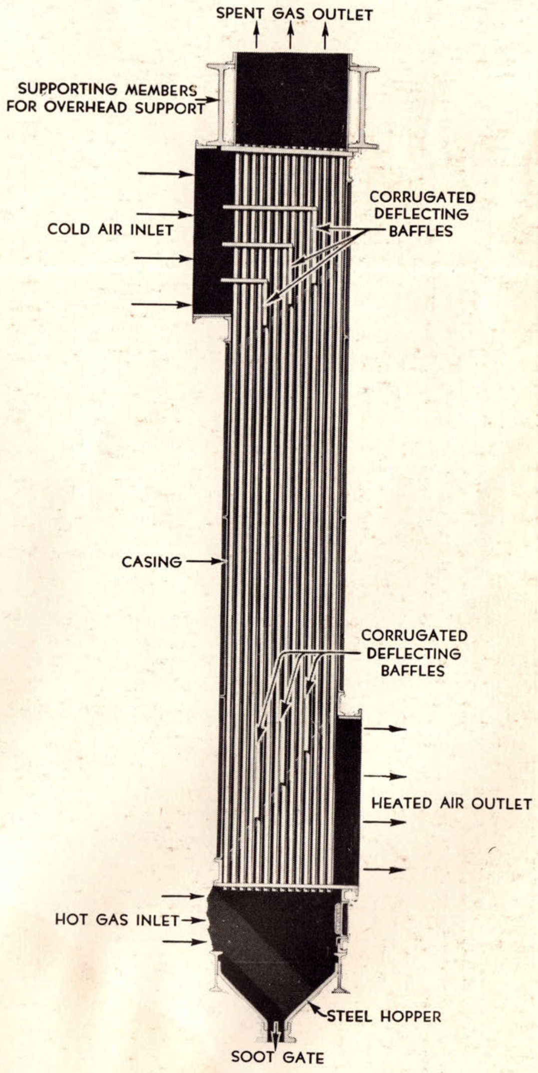
The gases flow through all tubes at uniform velocity, thus preventing the formation of pockets, which are common sources of tube corrosion. The air heater is inherently tight and maintains the separation of the air and gas streams.

This type of air heater has been built in sizes ranging from 218 to 80,200 square feet of heating surface.

In a somewhat similar design of B & W Tubular Air Heater, the gases flow around the outside of the tubes. The Company is also prepared to furnish air heaters of the direct-fired and plate types.



At the left—a Babcock & Wilcox Return-Bend Economizer. The sketch at the right shows the arrangement of the return-bend fittings in the Babcock & Wilcox Continuous-Tube Type Economizer

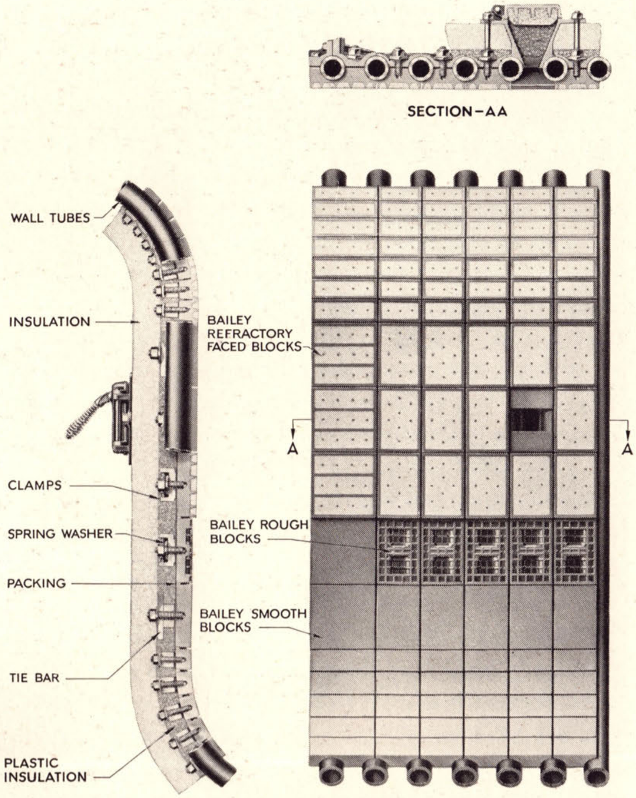

SPENT GAS OUTLET
SUPPORTING MEMBERS FOR OVERHEAD SUPPORT
COLD AIR INLET
CORRUGATED DEFLECTING BAFFLES
CASING
CORRUGATED DEFLECTING BAFFLES
HEATED AIR OUTLET
HOT GAS INLET
STEEL HOPPER
SOOT GATE

Babcock & Wilcox Tubular Air Heater

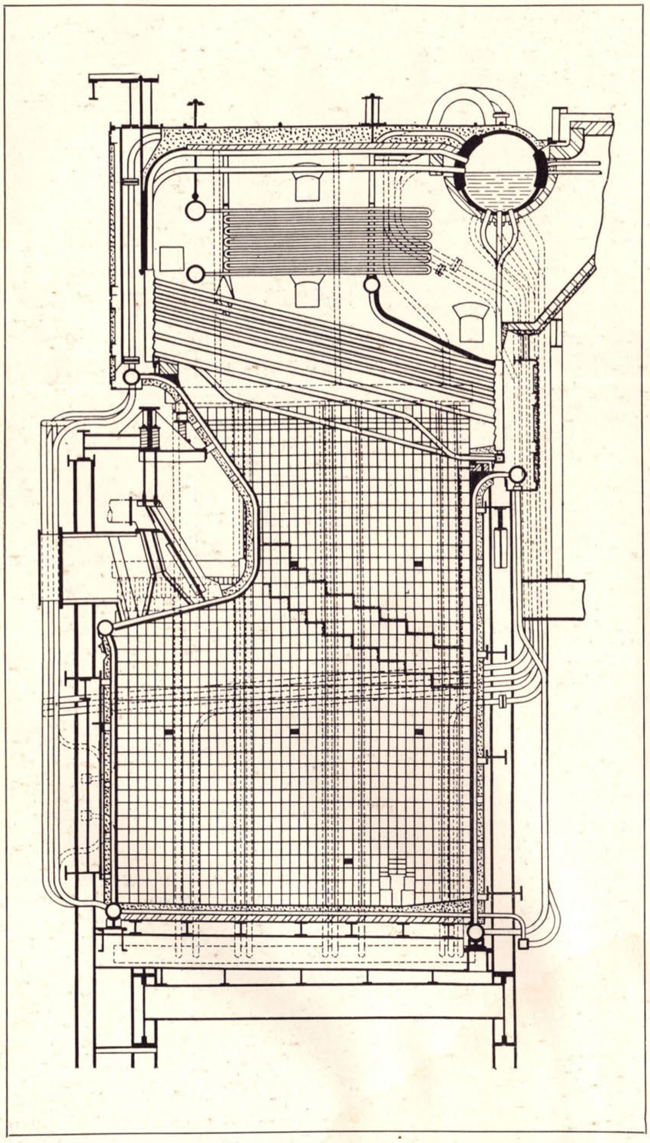
Bailey Water-Cooled Furnaces

Boiler furnace walls constructed of standard fireclay refractories are limited in their ability to withstand severe service conditions, such as high rates of heat liberation, erosive action of molten ash, and spalling caused by the rapid temperature variations accompanying intermittent operation.

Partial or complete water cooling of boiler furnaces has practically removed these limitations, and has made possible a degree of reliability for the over-all boiler unit not heretofore possible. The advantages to be gained by the use of correct water-cooling principles in furnace design are: ability to use larger and consequently fewer boiler units with attendant lower cost of installation per unit of capacity, continuity of operation, high combustion efficiency, and low cost of furnace maintenance.



A section of Bailey Water-Cooled Furnace Construction showing the refractory-faced, smooth and rough bare-metal blocks

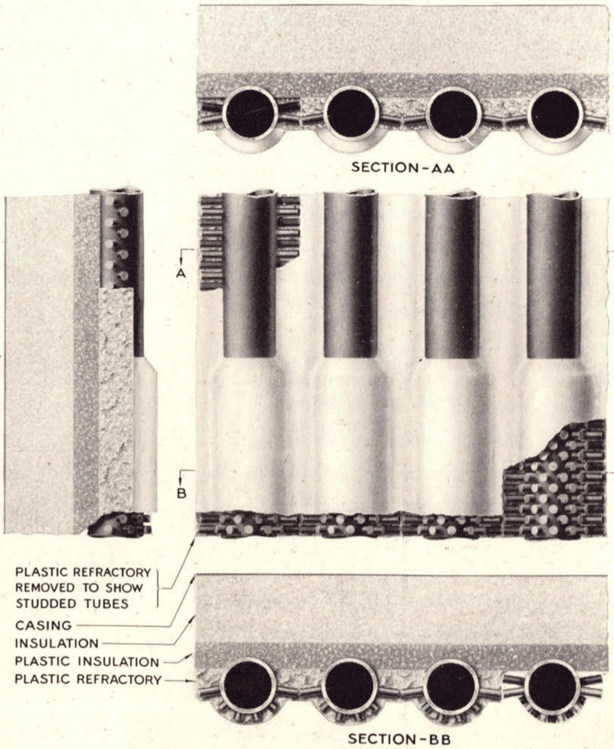


Bailey Water-Cooled Slag-Tap Furnace under a direct-fired, pulverized-coal-burning B & W Boiler

Bailey Water-Cooled Furnace Constructions were designed to meet these conditions, and have been developed and extensively used during the past eight years. The most important features of these constructions make possible:

> A furnace of any size, shape, or form suitable for any fuel or combustion method in which complete or partial water cooling is desirable.
>
> Constructions which permit the economic use of small-volume furnaces.
>
> A variety of tube coverings available to fill the requirements of satisfactory furnace performance, by presenting hot surfaces in the zones which should be hot for efficient combustion, and cold surfaces in the zones where furnace temperature reduction is desired.

Bailey Water-Cooled Furnaces



A section of Bailey Stud-Tube Construction

Water walls that provide, at any part of the furnace, the services required of them, with protection to the cooling tubes against overheating in certain zones and yet allowing the use of bare tubes where they are desirable.

Walls which provide cold, flat surfaces which will chill the ash but to which the ash will not adhere and, in the same furnace, rough surfaces which will accumulate a protective covering of slag.

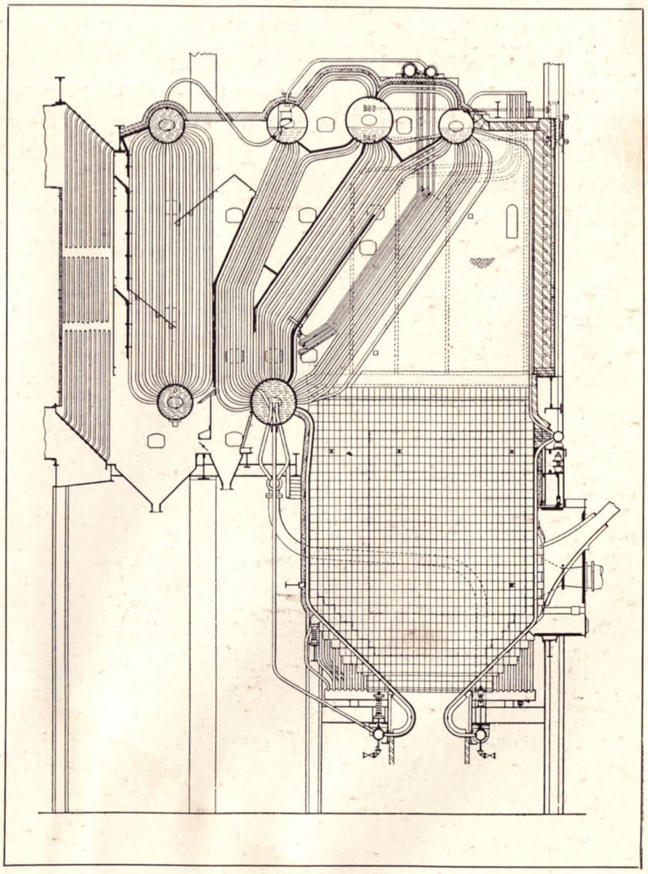
Wall structures which are airtight and provided with effective and durable seals where necessary, to allow for expansion or wall movement.

These characteristics, fundamental and inherent in Bailey Water-Cooled Furnaces, warrant the careful consideration of every user and prospective user of steam generating equipment.

The Bailey Water-Cooled Wall consists essentially of a system of water-cooling tubes expanded into headers at the top and bottom. The headers are connected to the boiler circulating system by riser and makeup connections, thereby providing adequate circulation. A variety of protective coverings for the furnace-cooling tubes is available to meet the specific conditions encountered. This protection is accomplished by the use of blocks mounted separately on, and bonded in close thermal contact with, the tubes, or by the use of Stud Tubes covered with refractory material.

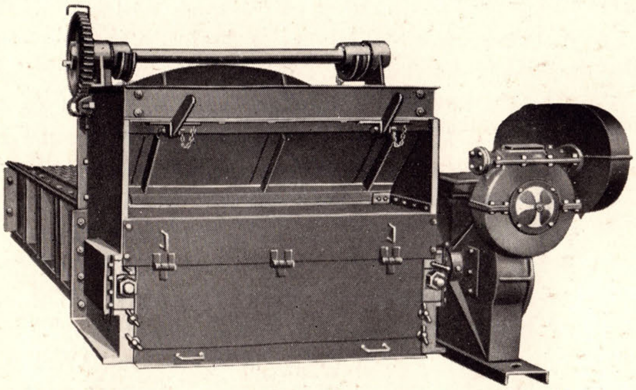
The blocks have a refractory-faced, a smooth or a rough bare-metal surface, the use of the three types depending on the conditions in the various furnace zones in which they are used. In the Stud-Tube construction, the tube-protecting surface consists of a refractory covering, of suitable thickness and conductivity to obtain the desired rate of heat transfer, molded over and held in place by studs welded to the tubes. This construction may be used in conjunction with Bailey Block-Covered Walls or to form entire walls.

The additional flexibility which the use of the Stud Tube gives to Bailey Water-Cooled Furnace construction enables a wider range of conditions to be met than has been possible heretofore, and is a very important development in furnace design and construction.



Bailey Water-Cooled Hopper-Bottom Furnace and Stirling Boiler with Babcock & Wilcox Superheater, Integral Economizer, and Air Heater

Chain-Grate Stokers



Front view of Standard Type Stoker

Babcock & Wilcox Chain-Grate Stokers are suitable for use with any free-burning bituminous coal, anthracite, lignite, or coke breeze. They are adaptable to natural draft, induced draft, or forced-blast air, depending upon the type of stoker and the conditions under which it is designed to operate. Each has separate air compartments under the grate and correctly proportioned dampers to permit regulating the amount of air supplied for combustion according to the requirements of the fuel bed. This is true of the smallest as well as of the largest size.

Double-reduction worm-gear-drive units of precision workmanship, bearings of ample proportions, links ground to size with jig-drilled holes, and many other important details of design and construction mark these stokers as typical Babcock & Wilcox products.

They are made in four types for stationary power plants and in one type for marine service.

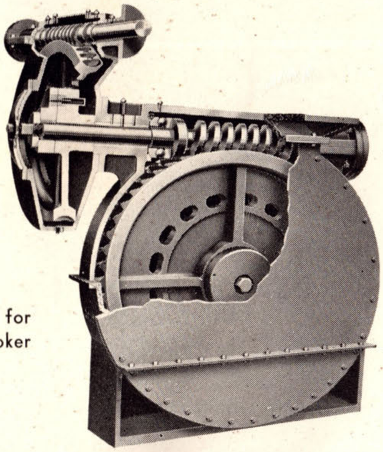
The smallest is made in sizes up to 70 square feet of effective grate area and must be used with forced draft.

The Standard Type is made in sizes up to 138 square feet of effective grate area, and may be used with natural, induced, or forced draft.

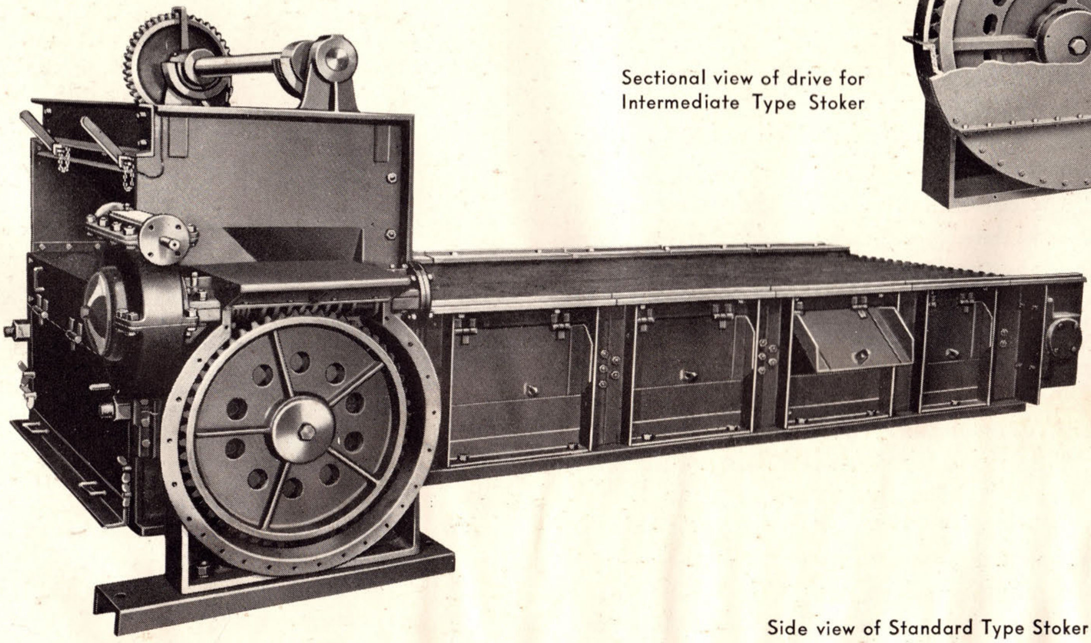
The Intermediate Type is made in sizes up to 235 square feet of effective grate area, and can be furnished with either bottom or side air admission.

The Heavy Duty Stoker is built in sizes up to 615 square feet of effective grate area, and can be furnished with either bottom or side air admission.

Either cold or preheated air may be used with the Intermediate or Heavy Duty Stokers, bottom air admission being preferable when preheated air and the greater widths of stokers are to be used.



Sectional view of drive for Intermediate Type Stoker



Side view of Standard Type Stoker

Burners for Liquid and Gaseous Fuels

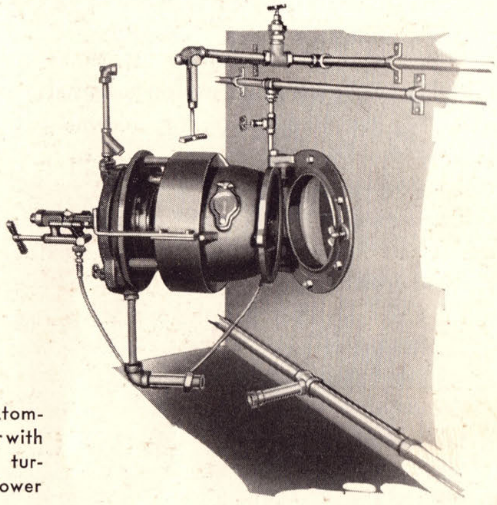
The Babcock & Wilcox Company has made a special study of burners and furnaces for liquid and gaseous fuels. Experience in the design and operation of such equipment, extending over many years, has developed a staff of engineers fully qualified to discuss with power plant designers and operators the many problems relative to new construction, or the modernization of obsolescent equipment, and to submit quotations on all apparatus and materials needed for oil-burning or gas-burning furnaces.

OIL BURNERS

Rapid and complete combustion characterize the action of Babcock & Wilcox Mechanical-Atomizing Oil Burners, making them suitable for use with not only large furnaces but also those of small volume. They are preeminent in their ability to operate efficiently at high capacities.

These burners are made in sizes suitable for use with both marine and stationary boilers, the latter including all power and heating boilers such as described elsewhere in this catalog. While they were designed primarily for operation with forced or induced draft, they may be used, at somewhat lower capacities, with natural draft.

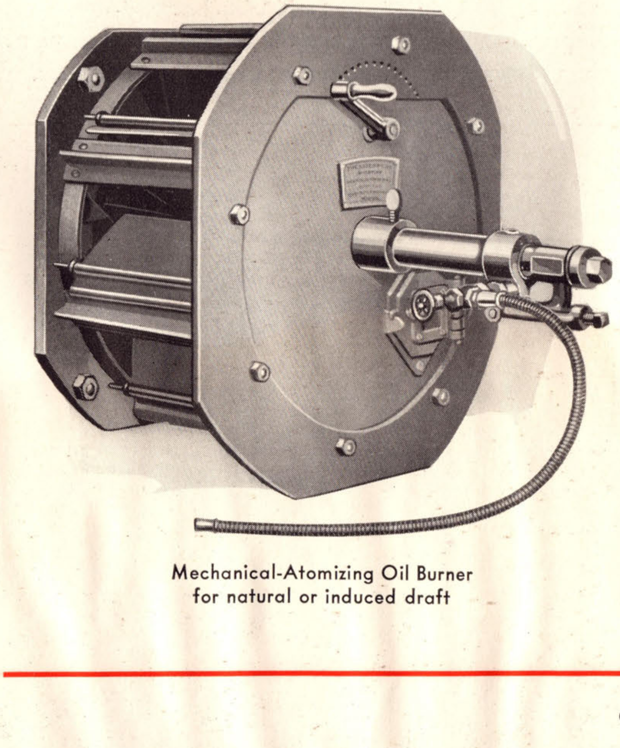
In principle, the design and operation of all sizes are alike, but one type differs from the others in that each unit has an integral turbine-driven blower that dispenses with the use of a large blower and ducts, and eliminates air leakage through dead burners.



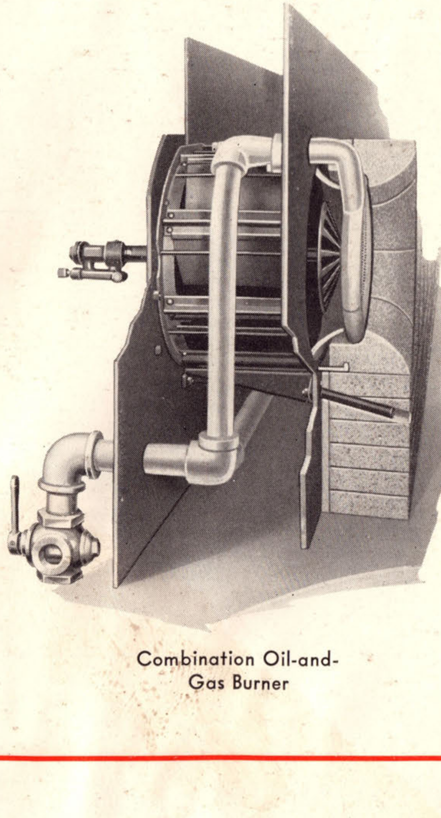
Mechanical-Atomizing Oil Burner with self-contained turbine-driven blower

COMBINATION OIL-AND-GAS BURNERS

The Company manufactures a highly efficient combination oil-and-gas burner. The gas is broken up into small streams, discharged at right angles into a constricted venturi throat, through which the air for combustion passes, insuring turbulent action and rapid combustion. This burner is made in heat-liberation capacities up to 70,000,000 B.t.u. per hour per burner using natural gas. Many installations and repeat orders provide evidence of its complete success.

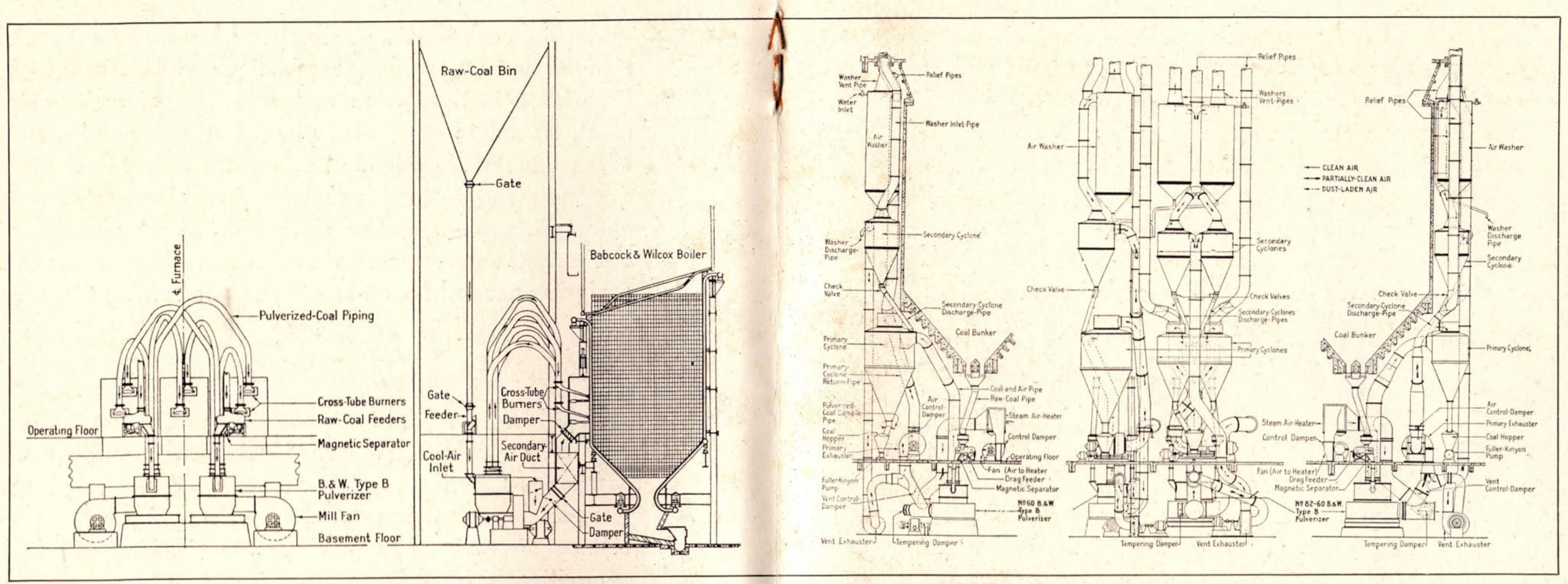


Mechanical-Atomizing Oil Burner for natural or induced draft



Combination Oil-and-Gas Burner

Pulverized-Coal Burners


Raw-Coal Bin
Gate
℄ Furnace
Pulverized-Coal Piping
Babcock & Wilcox Boiler
Cross-Tube Burners
Raw-Coal Feeders
Operating Floor
Magnetic Separator
B. & W. Type B Pulverizer
Mill Fan
Basement Floor
Gate
Feeder
Cool-Air Inlet
Cross-Tube Burners
Damper
Secondary Air Duct
Gate Damper
Washer Vent Pipe
Water Inlet
Relief Pipes
Washer Inlet Pipe
Air Washer
Washer Discharge Pipe
Secondary Cyclone
Check Valve
Secondary-Cyclone Discharge-Pipe
Coal Bunker
Primary Cyclone
Primary-Cyclone Return-Pipe
Pulverized-Coal Sample Pipe
Coal Hopper
Primary Exhauster
Air Control Damper
Coal and Air Pipe
Raw-Coal Pipe
Steam Air-Heater
Control Damper
Operating Floor
Fan (Air to Heater)
Drag Feeder
Magnetic Separator
Fuller-Kinyon Pump
Vent Control-Damper
Nº 60 B.&W. Type B Pulverizer
Vent Exhauster
Tempering Damper
Relief Pipes
Washers Vent-Pipes
Air Washer
CLEAN AIR
PARTIALLY-CLEAN AIR
DUST-LADEN AIR
Secondary Cyclones
Check Valve
Check Valves
Secondary-Cyclones Discharge-Pipes
Primary Cyclones
Steam Air-Heater
Control Damper
Fan (Air to Heater)
Drag Feeder
Magnetic Separator
Nº 82-60 B.&W. Type B Pulverizer
Tempering Damper
Vent Exhauster
Relief Pipes
Air Washer
Washer Discharge Pipe
Secondary Cyclone
Check Valve
Secondary-Cyclone Discharge-Pipe
Coal Bunker
Primary Cyclone
Air Control-Damper
Primary Exhauster
Coal Hopper
Fuller-Kinyon Pump
Vent Control-Damper
Tempering Damper
Vent Exhauster

BABCOCK & WILCOX PULVERIZED-COAL-BURNING SYSTEMS

The above illustration shows a typical layout of a direct-fired pulverized-coal-burning system. At the right of it is shown the arrangement of a storage system. Each has its advantages and special field of application, the selection being governed by the type of plant, load factor, space limitations, arrangement of the boilers, and methods by which the coal is handled and burned. A careful analysis of local conditions, by The Babcock & Wilcox Company previous to submitting recommendations of equipment, assures the selection of the system and equipment best suited to the needs of each case.

TURBULENT BURNING

In turbulent burning, where fuel and air are intimately mixed immediately upon entering the furnace, the requirements of the furnace and fuel-burning equipment are greatly simplified; definite control over the distribution of heat within the furnace is made possible, the furnace volume required for combustion is considerably reduced, and small furnaces occupying minimum building space may be used.

The Company has devoted considerable time and effort in the development of its complete line of burners possessing this important characteristic.

CROSS-TUBE BURNER

The Cross-Tube Burner is a high-capacity turbulent burner applicable to the horizontal firing of Bailey Water-Cooled Furnaces.

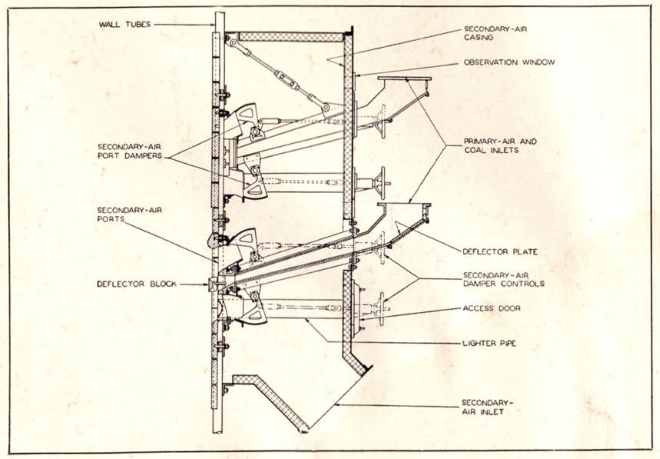
The stream of coal and primary air from each burner nozzle is broken up in passing between the tubes of the furnace wall, thus preventing stratification. The secondary air for each burner enters the furnace through ports immediately above and below the jets of primary air and coal, and at an angle to them, causing violent intermingling of this air stream with the fuel stream. Turbulent mixing of the coal and air therefore takes place immediately on their entering the furnace.

Cross-Tube Burners are in successful operation in heat-liberating rates ranging from 60,000,000 to 135,000,000 B.t.u. per burner per hour.

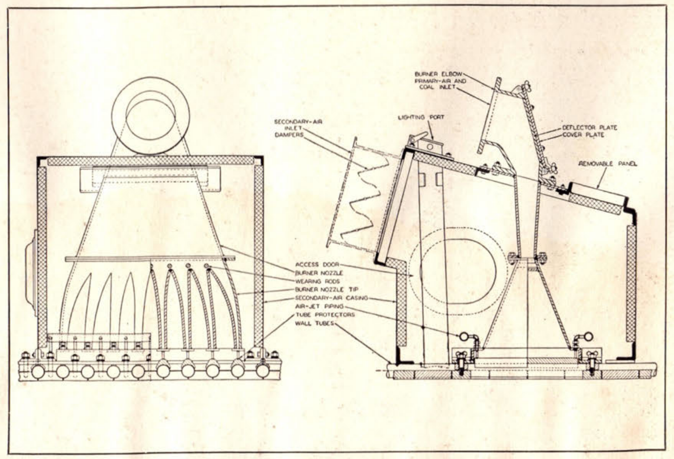
MULTIPLE INTERTUBE BURNER

The Multiple Intertube Burner is especially adapted to vertical firing of Bailey Water-Cooled Slag-Tap Furnaces. It is a burner of exceptional capacity and high turbulence.

This burner is so arranged in the arch of the furnace that it directs the streams of pulverized coal and air downward toward the furnace floor, and at a slight angle from the front wall. The U-shaped path of the flame thus obtained provides sufficient travel for the completion of combustion before the gases strike the lower rows of boiler tubes, reducing to a minimum the amount of unconsumed carbon passing out of the furnace with the flue gases.


WALL TUBES
SECONDARY-AIR CASING
OBSERVATION WINDOW
PRIMARY-AIR AND COAL INLETS
SECONDARY-AIR PORT DAMPERS
SECONDARY-AIR PORTS
DEFLECTOR PLATE
DEFLECTOR BLOCK
SECONDARY-AIR DAMPER CONTROLS
ACCESS DOOR
LIGHTER PIPE
SECONDARY-AIR INLET

Cross-Tube Burner


BURNER ELBOW
PRIMARY-AIR AND COAL INLET
LIGHTING PORT
SECONDARY-AIR INLET DAMPERS
DEFLECTOR PLATE
COVER PLATE
REMOVABLE PANEL
ACCESS DOOR
BURNER NOZZLE
WEARING RODS
BURNER NOZZLE TIP
SECONDARY-AIR CASING
AIR-JET PIPING
TUBE PROTECTORS
WALL TUBES

Multiple Intertube Burner

Pulverized-Coal Burners

The design assures low pressure loss through the burner, and yet maintains the required high turbulence.

Burners of this type are in operation at ratings up to 144,000,000 B.t.u. liberation per burner per hour.

INTERTUBE BURNER

The Intertube Burner is a high-capacity turbulent burner designed for discharging pulverized coal between the tubes of a Bailey Water-Cooled Furnace. The secondary-air streams are directed across the path of coal-laden primary air in such manner that a high degree of turbulence is obtained, resulting in rapid combustion and a short flame.

Intertube Burners are in service in sizes having heat-liberating capacities up to 115,000,000 B.t.u. per burner per hour.

CIRCULAR BURNER

The Circular Burner is widely used with refractory furnace walls and can be installed in existing walls with minimum alterations.

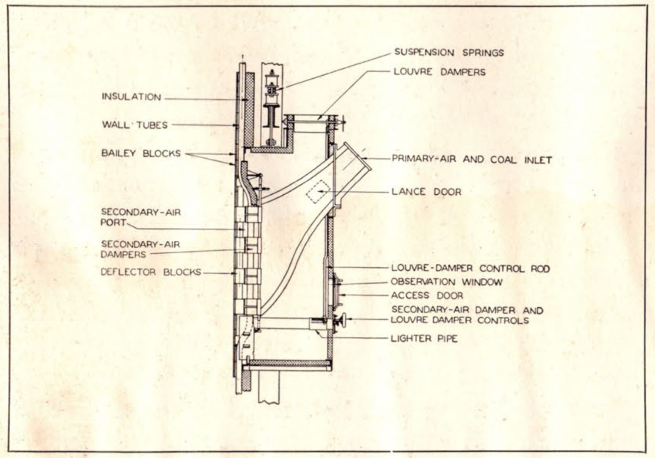
It is simple in design and requires little adjustment within a wide range of capacity. An adjustable deflector, mounted at the furnace end of the primary-air and pulverized-coal pipe, insures intimate mixing with the secondary air and furnishes a high degree of turbulence. This burner, normally designed for forced-draft operation, is also adaptable to natural-draft operation at limited capacities.

Circular Burners are available in sizes having heat liberating capacities up to 100,000,000 B.t.u. per burner per hour.

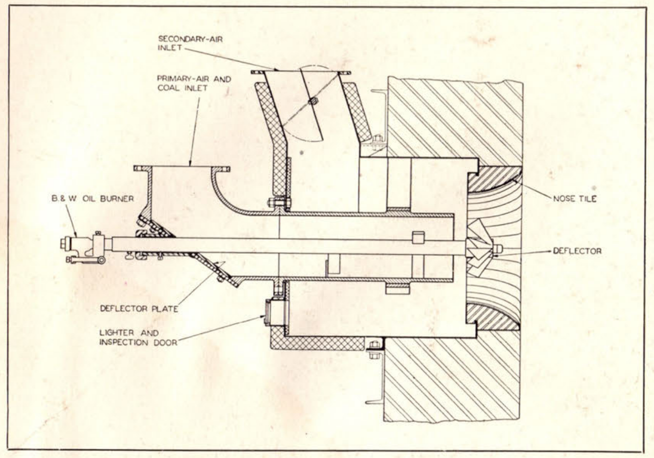
MULTIFUEL CIRCULAR BURNER FOR PULVERIZED FUELS, OIL, AND GAS

By means of this multifuel burner, which is of the horizontal turbulent type, liquid, gaseous, or solid fuels in pulverized form may be injected into a furnace through a common throat opening.

It combines the features of the Circular Burner and the B & W Mechanical-Atomizing Oil Burner, together with such additions as are necessary for the efficient burning of gas. High efficiency is obtained with any fuel, since means are provided for thoroughly mixing the fuel with the necessary air for combustion.

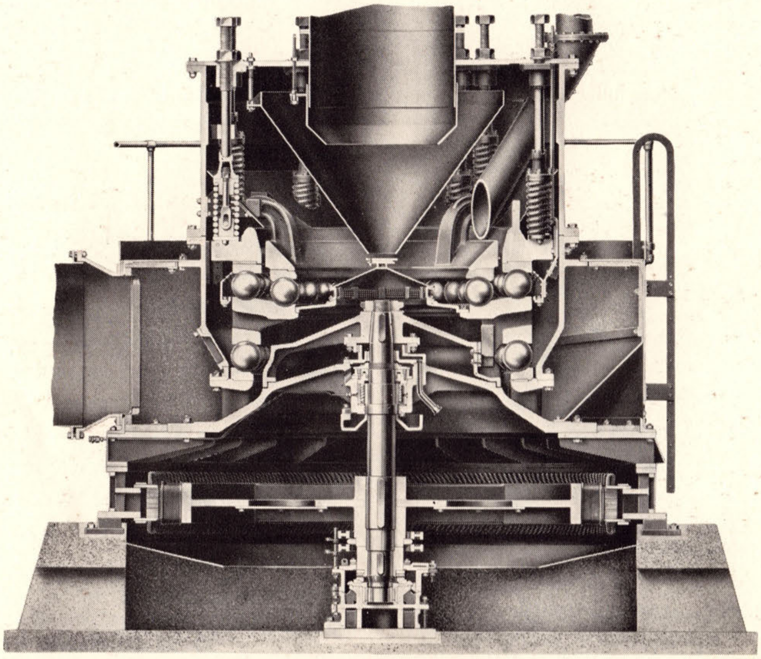

SUSPENSION SPRINGS
LOUVRE DAMPERS
INSULATION
WALL TUBES
BAILEY BLOCKS
PRIMARY-AIR AND COAL INLET
LANCE DOOR
SECONDARY-AIR PORT
SECONDARY-AIR DAMPERS
DEFLECTOR BLOCKS
LOUVRE-DAMPER CONTROL ROD
OBSERVATION WINDOW
ACCESS DOOR
SECONDARY-AIR DAMPER AND LOUVRE DAMPER CONTROLS
LIGHTER PIPE

Intertube Burner

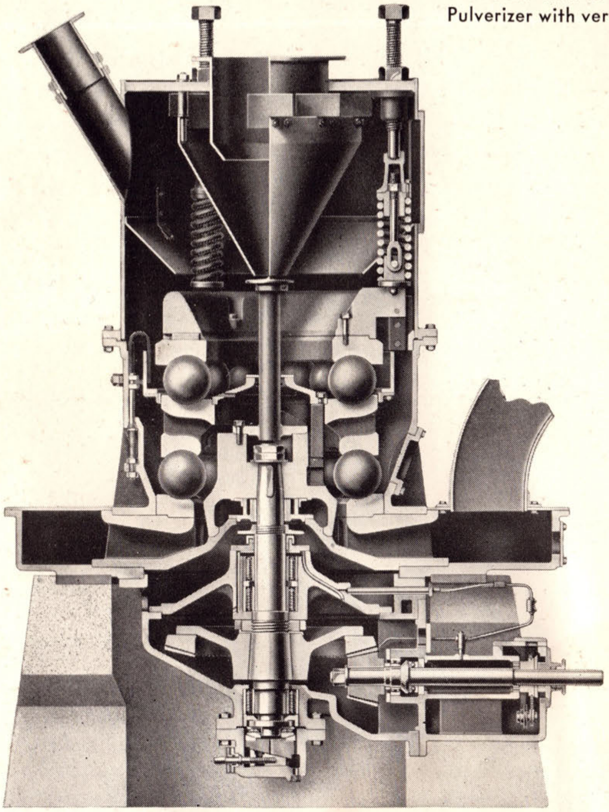

SECONDARY-AIR INLET
PRIMARY-AIR AND COAL INLET
B. & W. OIL BURNER
NOSE TILE
DEFLECTOR
DEFLECTOR PLATE
LIGHTER AND INSPECTION DOOR

Circular Pulverized-Coal Burner

B & W Type B Pulverizer for Coal



Sectional View of high-capacity B & W Type B Pulverizer with vertical synchronous-motor drive



Sectional View of B & W Type B Pulverizer with two rows of balls for intermediate capacities

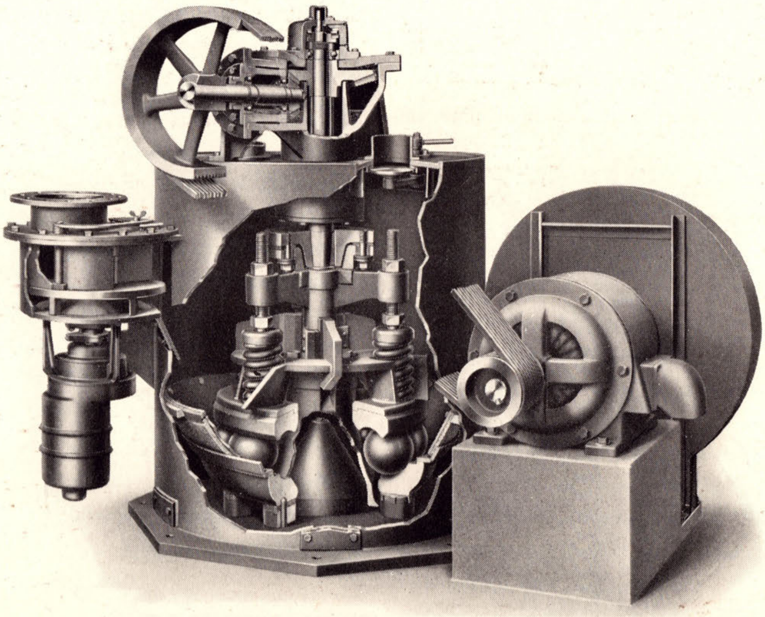
The B & W Type B Pulverizer is the only mill employing the ball-bearing grinding principle, which has been successfully and economically used over the whole range of capacities demanded by present practice. Its sturdy construction and simplicity of control make the Type B Pulverizer particularly well suited to serve both large and small direct-fired boilers, including units that have rapidly fluctuating industrial loads. It is equally well adapted to the requirements of the storage system of pulverized-coal firing. It is suitable for pulverizing all available coals and other solid fuels. Noteworthy features of the Type B Pulverizer include the small space required, operation at low speed, consistent performance in fineness and capacity, low power consumption, and low cost of maintenance.

This pulverizer is of the ball and grinding-ring type, having the grinding pressure applied independently of the mill speed and the weight of the balls.

The Type B Pulverizer runs at constant speed and has a wide range of output—varying from its full capacity to the minimum permitted by satisfactory operation of the burners. Changes in capacity are made by varying the rate of coal feed.

Essentially, the grinding element consists of rows of balls, nine inches in diameter, interposed between stationary and rotating grinding-rings. The balls are propelled

B & W Type B Pulverizer for Coal



Sectional View of B & W Type B Pulverizer for small capacities

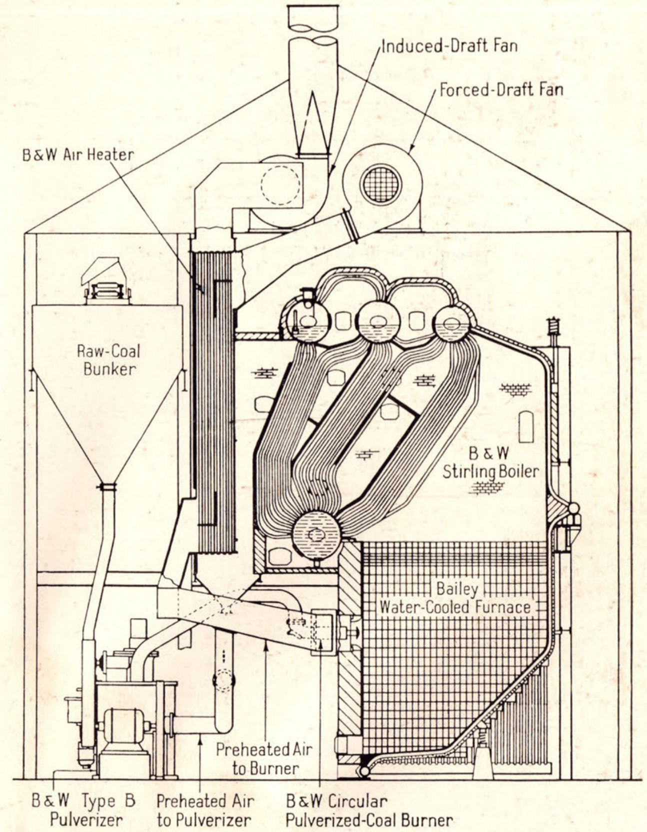
by the rotating ring, which floats on, and is driven by, the main shaft. The grinding pressure is applied and kept uniform by springs which, in the larger sizes, are externally controlled. This type of grinding element is economical in operation and is a practical construction for mills having capacities from a few pounds up to 50 tons or more per hour. Fineness is not affected by wear of the grinding parts.

This pulverizer is applicable to coals or other materials of varying grindability, since the grinding pressure can be adjusted to suit the hardness of the material to be ground. Wet coal can be pulverized when preheated air is used for the separation of the fines, since the coal is dried as it passes through the mill.

No lubrication is required within the grinding zone. All bearings and gears are enclosed in dust-tight and oil-tight housings, and are lubricated by an automatic force-feed oiling system. This method provides effective lubrication, resulting in long life of the bearings and gears.

The cost of maintenance is exceptionally low, because of the few wearing parts, their simplicity of design, and the high-grade wear-resisting materials of which they are constructed. Replacements can be quickly and easily made.

When this pulverizer is used for direct firing of boilers and furnaces, a simple arrangement of equipment is possible. A standard type of blower may be used to supply air under pressure to the mill, and the discharge piping may lead directly to the burner.


Induced-Draft Fan
Forced-Draft Fan
B&W Air Heater
Raw-Coal Bunker
B&W Stirling Boiler
Bailey Water-Cooled Furnace
Preheated Air to Burner
B&W Type B Pulverizer
Preheated Air to Pulverizer
B&W Circular Pulverized-Coal Burner

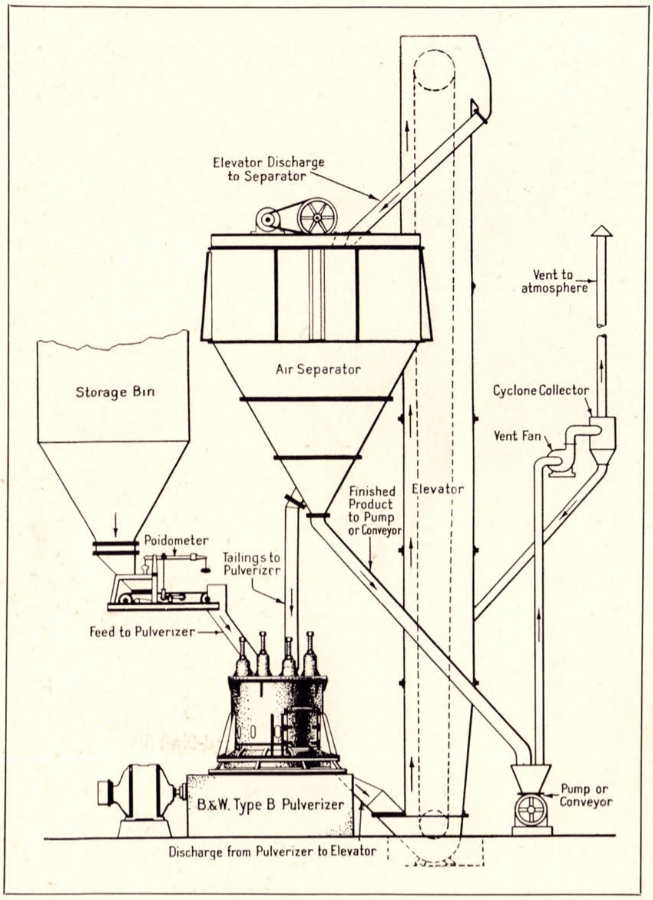
Arrangement of Stirling Boiler with Babcock & Wilcox Pulverized-Coal Equipment for a small industrial power plant

Pulverizers for Cement Plants . . .

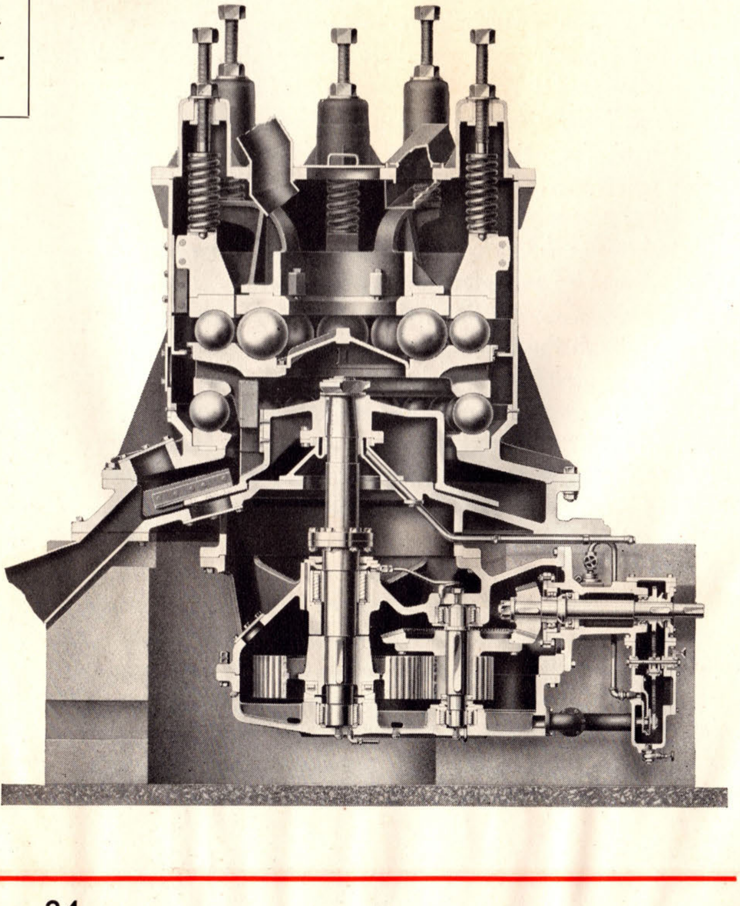
Marked reductions can be made in the cost of manufacturing cement by using the B & W Type B Pulverizer for grinding raw materials and cement clinker, and for direct firing pulverized coal to kilns.

In the preparation of cement materials, this pulverizer operates in closed circuit with a mechanical classifier and reduces cement rock or clinker, in a single operation, to such fineness that the product may be delivered directly to the kilns or silos. The equipment used occupies less space than that usually required, and the fixed charges and maintenance costs are materially lower. Furthermore, the power ordinarily required for raw-material grinding is reduced as much as 50 per cent, and that for clinker grinding is reduced approximately 30 per cent.

The following are typical performance data taken from the operating records of this pulverizer in regular cement plant service:


Elevator Discharge to Separator
Vent to atmosphere
Air Separator
Storage Bin
Cyclone Collector
Vent Fan
Finished Product to Pump or Conveyor
Elevator
Poidometer
Tailings to Pulverizer
Feed to Pulverizer
B.&W. Type B Pulverizer
Pump or Conveyor
Discharge from Pulverizer to Elevator

Arrangement of equipment in closed-circuit grinding system using B & W Type B Pulverizer



Cross-Section of B & W Type B Pulverizer gravity discharge type—with gear drive

Raw Material . . . Cement Clinker . . . Coal

GRINDING CEMENT ROCK

Size of feed	1½ inches and under
Grindability index of feed	75
Fineness of product	90% through 200 mesh
Capacity of mill	35 tons per hour
Power consumed by mill	7.75 kw-hr., per ton
Power consumed by elevator and separator	1.56 kw-hr., per ton
Total power consumed by mill, elevator, and separator	9.31 kw-hr., per ton 2.79 kw-hr., per barrel

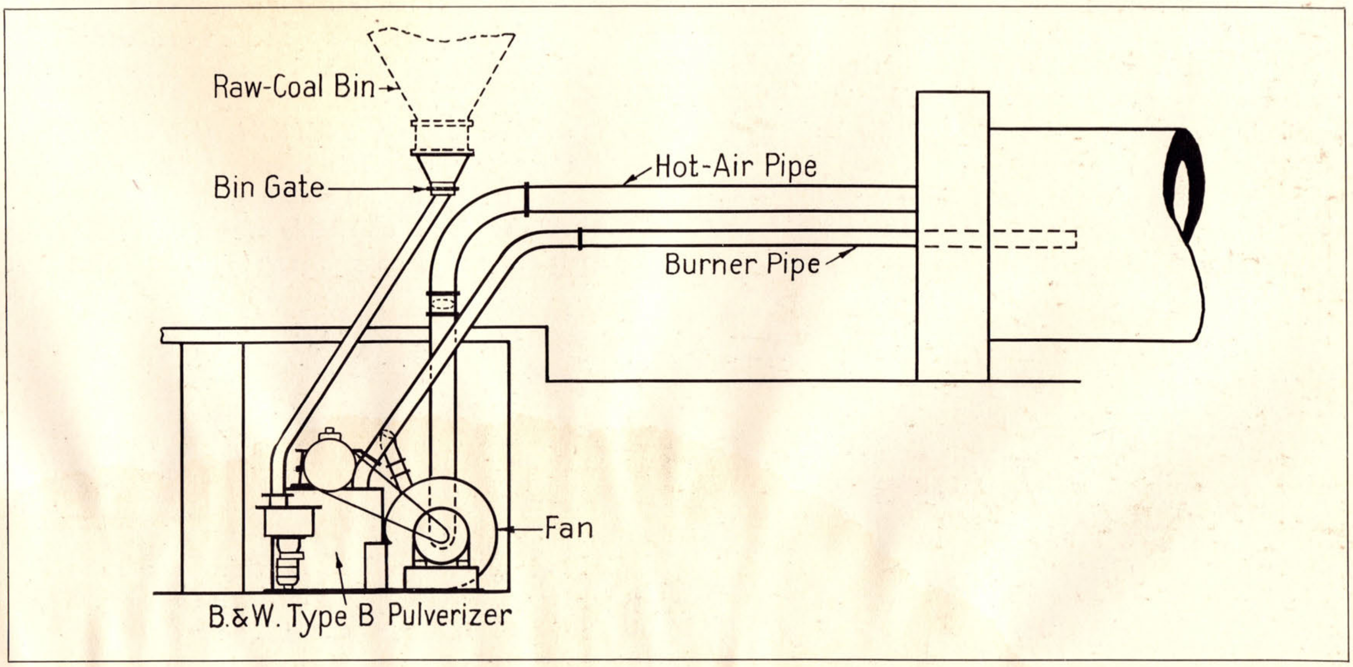
GRINDING CEMENT CLINKER

Size of feed	As received from kiln
Grindability index of feed	30
Fineness of product	90% through 200 mesh
Capacity of mill	100 barrels per hour
Power consumed by mill	3.30 kw-hr., per barrel
Power consumed by elevator and separator	0.60 kw-hr., per barrel
Total power consumed by mill, elevator, and separator	3.90 kw-hr., per barrel

The great output of this pulverizer is due to the rapidity with which the material passes through the mill, the plurality of grinding zones, and the positive grinding action of the balls. The relatively high efficiency of the Type B Pulverizer is due to the prompt and complete scavenging of pulverized material.

The material handled flows through the mill in a thin, evenly distributed layer, and the fines, being discharged without delay, are prevented from accumulating and interfering with the pulverizing operation. Each ball, co-acting with its grinding ring, works effectively over its entire travel, with the grinding pressure applied directly to the material and to a minimum amount of material at a time, resulting in efficient operation at a low cost for power.

All the advantages of direct pulverized-coal firing of kilns may be realized, with a small initial investment, through the use of a pulverizer such as that shown on page 23. This mill possesses the same features of design and construction that have made the larger B & W Type B Pulverizers so reliable and dependable in direct-fired boiler installations. It pulverizes coal to uniform fineness—at all times — irrespective of wear of the grinding elements. Coal and primary air are thoroughly mixed inside the mill casing, making driers unnecessary where preheated air is used. Coal consumption is reduced by eliminating flame pulsations, and losses of volatile matter and coal dust.



Arrangement of equipment for direct-firing of cement kilns using B & W Type B Pulverizer

Pulverized-Coal Feeding and Transporting Equipment

FULLER-KINYON TRANSPORT SYSTEM

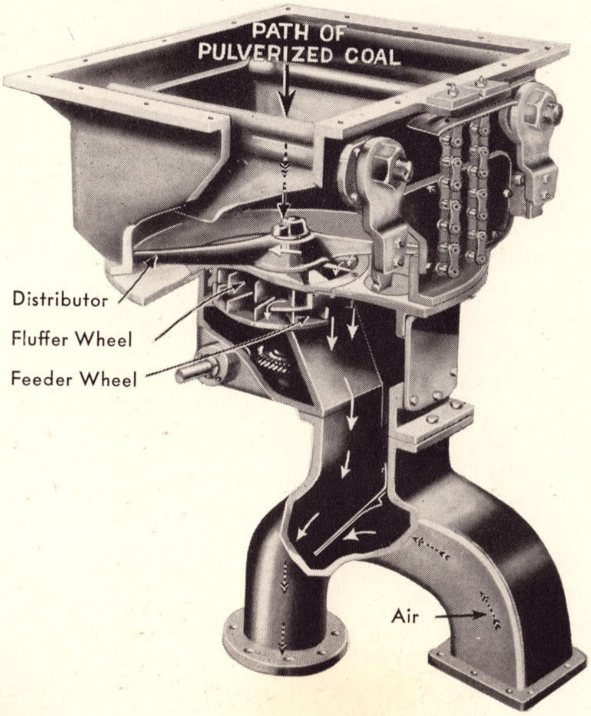
The Fuller-Kinyon Transport System is a clean and economical method of transporting and distributing pulverized coal.

The coal is conveyed through a standard-size pipe line with the ease and safety of a fluid. The pipe lines may be of any length up to one mile and may run in any direction, with numerous bends, risers, and branch lines. The lines may be installed within the building, outdoors, or underground.

Because of its great flexibility, this system is especially valuable to those plants in which the pulverizers are far removed from the bins, kilns, or furnaces.

Various means for controlling the coal distribution are available. These range from manual to complete automatic control of feed to all bins in a system, or any combination of manual, remote and automatic control best suited to plant conditions.

Fuller-Kinyon Transport Systems are simple in design, sturdy in construction, and dependable in operation. They are available in single line capacities ranging from 1 to 100 tons of pulverized coal per hour.



Bailey Pulverized-Coal Feeder

BAILEY PULVERIZED-COAL FEEDER

The Bailey Feeder is widely used in central stations and industrial power plants to deliver pulverized coal uniformly from storage bins to boiler furnaces and, in cement plants, to feed rotary kilns.

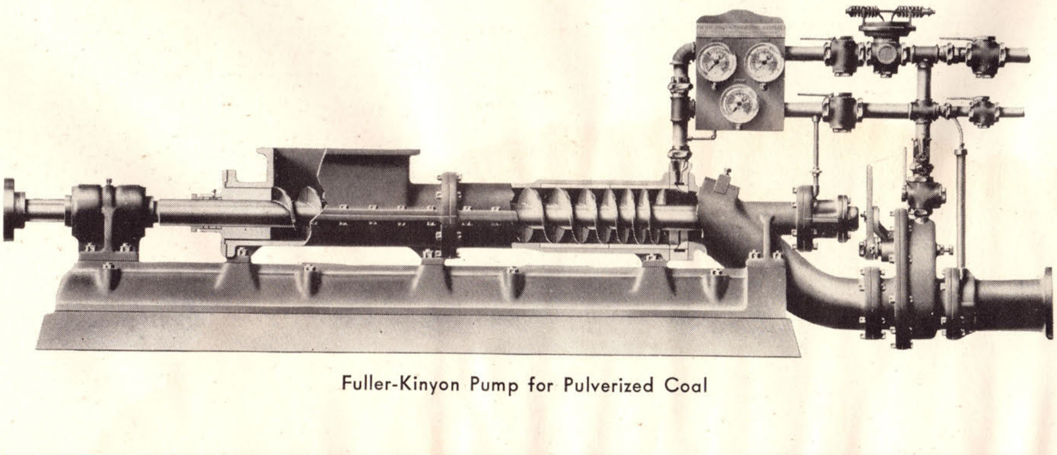
A distributor rotating at the bottom of the feeder hopper keeps the entire mass of pulverized coal constantly agitated, thus preventing arching of the coal in the hopper.

Coal dropping into the compartments of the fluffer wheel is carried around and dropped into the feeder wheel, and then discharged into the burner pipe, being aerated — not compacted — while passing through the feeder.

The operation of the feeder is such that it discharges a measured stream of uniformly aerated coal, and thereby eliminates the fluctuations and flooding associated with the screw type of feeder.

A revolution counter records the number of revolutions of the feeder wheel. This counter, when calibrated, serves as a meter of great accuracy.

The rate of feed is adjustable over a wide range. The feeder is designed for capacities up to 12,000 lbs. per hour.



Fuller-Kinyon Pump for Pulverized Coal

Driers

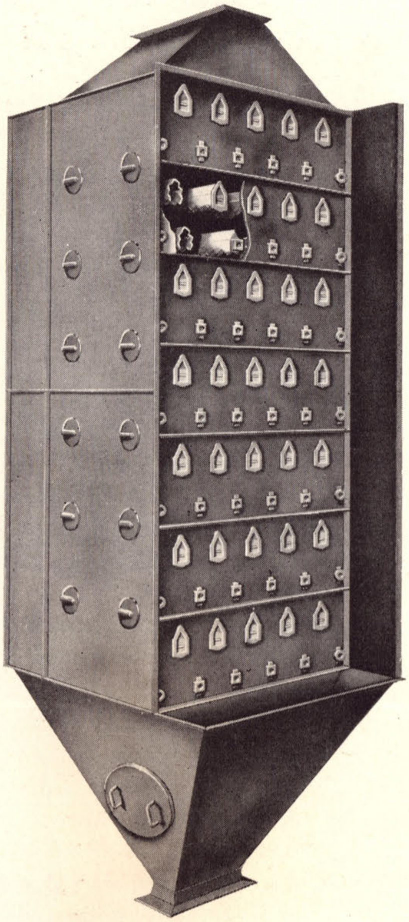
RANDOLPH VERTICAL DRIER

The Randolph Vertical Drier is widely used for drying materials that are coarse enough to permit a free flow of gases between particles. A high rate of moisture removal is obtained since the heated gases are in direct contact with the material being dried.

This drier utilizes hot gases from flues, air preheaters, or from separately-fired furnaces. The undried material enters at the top and travels downward, the rate of flow depending on the amount of material withdrawn.

The drier is built in sturdy, dust-tight unit sections mounted vertically. It requires only a small space and may be installed between a bunker and a pulverizer.

When used for coal, these driers are available for drying up to 25 tons per hour.



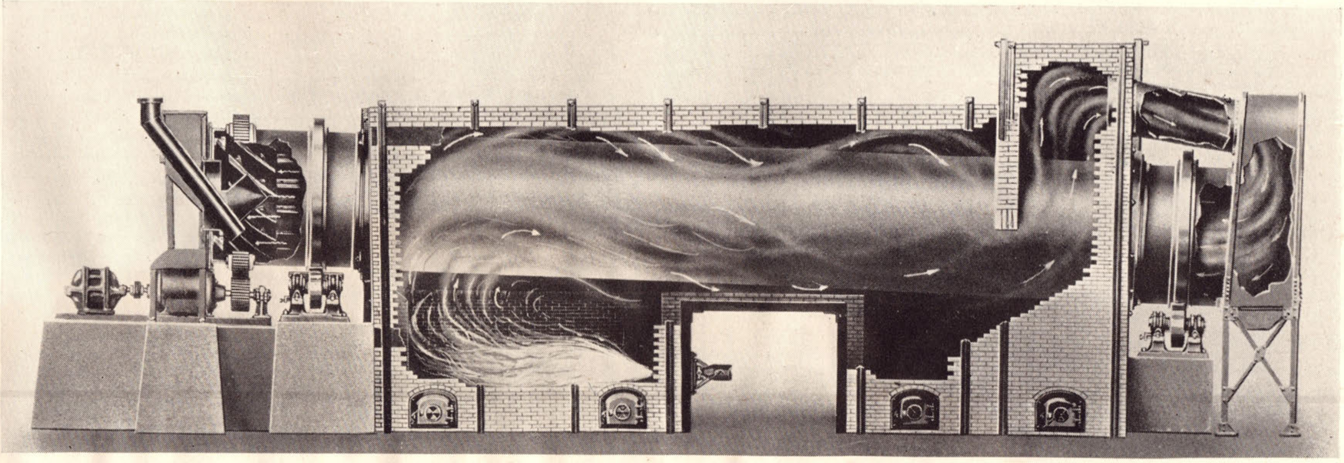
Randolph Vertical Drier

FULLER LEHIGH ROTARY DRIER

The Fuller Lehigh Rotary Drier is well suited for drying large quantities of materials that are not injured by direct contact with the hot products of combustion. It is reliable and flexible in operation over a wide range of output and moisture removal.

Drying is effected by transfer of heat through the shell, and by direct contact of the hot gases with the material being dried while the material is passing through the shell. This drier may be arranged for hand firing, pulverized-coal, or oil firing. Direct control of drying conditions is obtained by varying the rate of heat input, the velocity of the hot gases flowing through the drier, and the rate of feed of the material being dried.

When used for drying coal, the capacities of the driers are up to and including 30 tons per hour each.



Fuller Lehigh Rotary Drier

B & W Refractories

B & W 80 FIREBRICK

The B & W 80 Firebrick is particularly adapted to furnaces where supported loads are heavy, where temperatures are high, or where severe operating conditions cause rapid deterioration of other brick. With the exception of a few slag reaction cases, this firebrick can be used in every type of furnace fired with coal, oil, tar, gas, or refuse.

This firebrick is processed by patented methods to develop maximum refractory qualities, and is made entirely from a special refractory Kaolin. It is unusual in its low expansion, absence of shrinkage, and uniformity of structure and dimensions.

In addition to maintaining stocks of B & W 80 Firebrick in all standard sizes, the Company is prepared to make special shapes in a wide variety of sizes and forms. These special shapes are produced from the same materials and by the same process used in the manufacture of B & W 80 Standard Firebrick, by men who have specialized in this work, with kilns and other equipment operated for that purpose.

B & W 80 JUNIOR FIREBRICK

The B & W 80 Junior Firebrick is a moderately-priced refractory that is exceeded only by the 80 Firebrick in characteristics requisite to long life under severe conditions. Its use is a profitable investment where the severity of service makes the application of fireclay brick costly, yet not so extreme as to justify the use of B & W 80 Firebrick at its higher price.

B & W INSULATING FIREBRICK

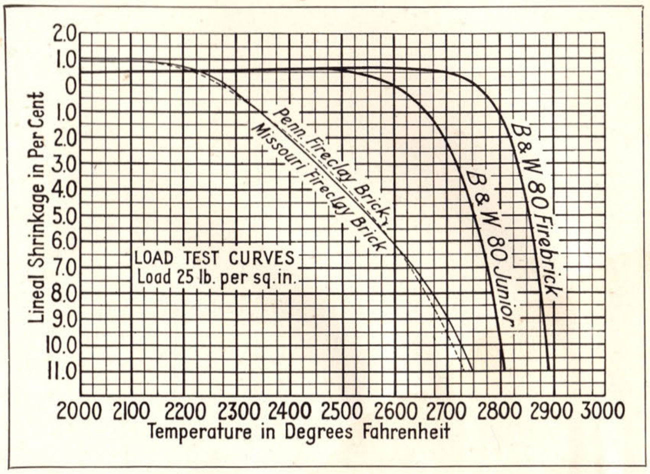
The B & W Insulating Firebrick is a radically new furnace-lining product which exhibits insulating qualities superior to all commercially-available high-temperature insulators and, at the same time, possesses refractoriness equal to, or better than, first-quality fireclay brick. Its low heat conductivity reduces radiation losses, thereby effecting material savings in fuel costs, and insuring a uniform temperature throughout the furnace. Its low heat-storage capacity makes possible a greater degree of responsiveness to temperature control, as compared with the usual refractory lining, and when B & W Insulating Firebrick is used to line intermittently-fired furnaces, marked savings in both fuel and starting time are effected.

It is suitable for the exposed linings of oil-fired and gas-fired furnaces, electric furnaces of the resistance type, process equipment and coal-fired furnaces, but in the latter, only in those areas not subjected to mechanical abrasion or slag action.

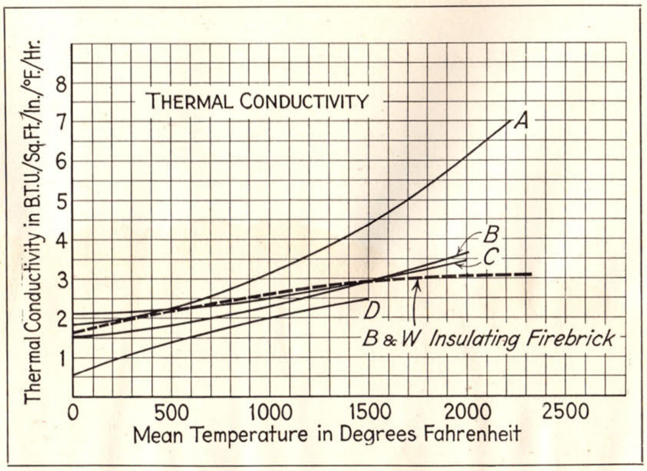
The B & W Insulating Firebrick is supplied in all standard sizes and may be built-up into special shapes. The material is easily cut, drilled, or shaped with ordinary wood-working tools.

A study of the comparative curves, in the figure below, shows the excellent insulating qualities of the B & W Insulating Firebrick. A and C are thermal conductivity curves of two high-temperature insulators while B and D are curves of burned low-temperature insulators.

Although Insulators B and D have better insulating properties than the B & W Insulating Firebrick they can be used only for temperatures up to 1600 deg. fahr. Insulators A and C reach their maximum use limit at 2200-2500 deg.



Comparative Load-Carrying-Capacity Curves



Comparative Thermal Conductivity Curves

B & W Refractories

fahr. The fusion point of the B & W Insulating Firebrick is 3190 deg. fahr. and can be used to 2850 deg. fahr. without shrinkage. Above this temperature, a slight surface shrinkage occurs during the initial firing but can be easily remedied by an application of mortar.

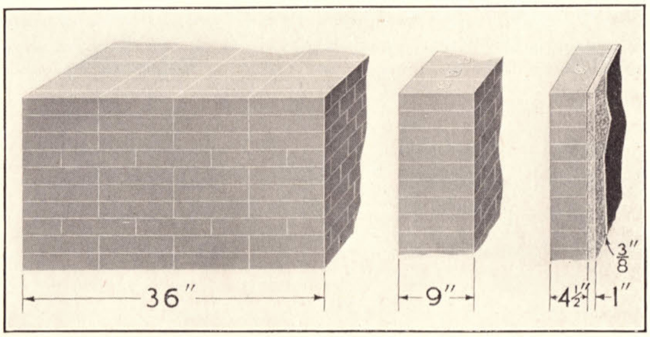


Figure 1—Three Walls of Equal Heat Flow. From left to right . . . 36 in. of standard firebrick, 9 in. of B & W Insulating Firebrick, and 4½ in. of B & W Insulating Firebrick and 1 in. of coated block insulation.

B & W MORTARS AND PLASTICS

B & W Mortars and Plastics are made from a special Georgia Kaolin treated and blended with other pure ingredients in a patented process to develop certain definite characteristics in each material. All have extremely low expansion coefficients, show little shrinkage, are chemically inert, and will not fuse, crack, or bloat within the temperature ranges of commercial furnaces.

Although each mortar and plastic is made for one specific set of conditions, the group as a whole covers all the usual furnace requirements. The accompanying tables show the physical characteristics of each material and state where each can be used most effectively.

OTHER B & W REFRACTORY PRODUCTS

B & W Calcine, crushed and carefully graded, is used for sagger mixes and cement bases. This material will not shrink at temperatures under 3000 degrees fahrenheit and is of value in any mixture where a preshrunk inert material of high fusion-temperature is desired.

The B & W Laboratory Furnace is a small gas-fired crucible furnace, lined with B & W Insulating Firebrick. It is widely used for rapid melting of metals, glasses, or enamels.

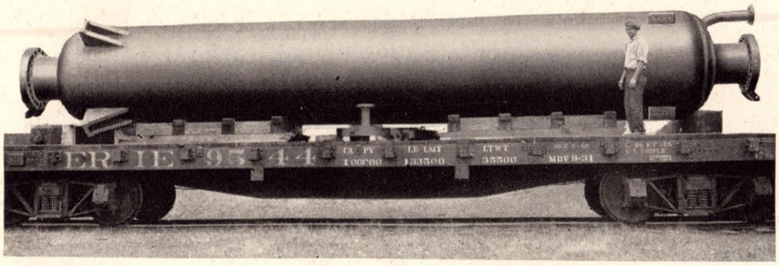
	Chief Characteristic or Use	Temperature Deg. Fahr.			Hot or Cold Set	Weight, Volume, etc.			Mesh or Fineness	Containers					
		Vitrification	Melting	Use Limit		Weight per cu. ft.	Lb. Used per 1000 Brick	Sq. Ft. Face Washed with 1 lb. of Mortar		Weight of Standard Container		Weight of Special Container		Shipped in Drums or Bags	Shipped Wet or Dry
										Net	Ship.	Net	Ship.		
B & W High-Temperature Mortar	Forms cushioned joint	2200	3180	3150	Hot	—	350	5	Fine	100	101	50	51	Bags	Dry
B & W Patching Mortar	Sticks to glazed brick. Forms a medium bond	—	3170	3140	Cold	—	400	4½	Fine	200	212	100	107	Drums	Wet
B & W Air-Set Mortar	Forms a very highly bonded joint	—	3075	3050	Cold	—	400	4½	Fine	200	212	100	107	Drums	Wet
B & W Moldable	High temperature plastic	2200	3180	3150	Dries hard in air	120	—	—	Coarse	200	212	—	—	Drums	Wet
B & W Baffle Mix	Lower temperature plastic	—	2750	2600	Cold	115	—	—	Coarse	100	101	50	51	Bags	Dry

Characteristics or properties common to all B & W Mortars and Plastics:

- Special refractory Georgia Kaolin base.
- Manufactured products—new materials only—uniform.
- Manufactured by controlled process.
- Expansion and contraction substantially same as fire-clay brick.
- Not recommended for use with Chrome, Magnesite, or Silicon Carbide brick.

The unique combination of properties in these products allows the group as a whole to be used for the eleven kinds of work necessary in the average furnace, and the Selection Chart makes the choice of the right mortar or plastic for a given service an easy matter.

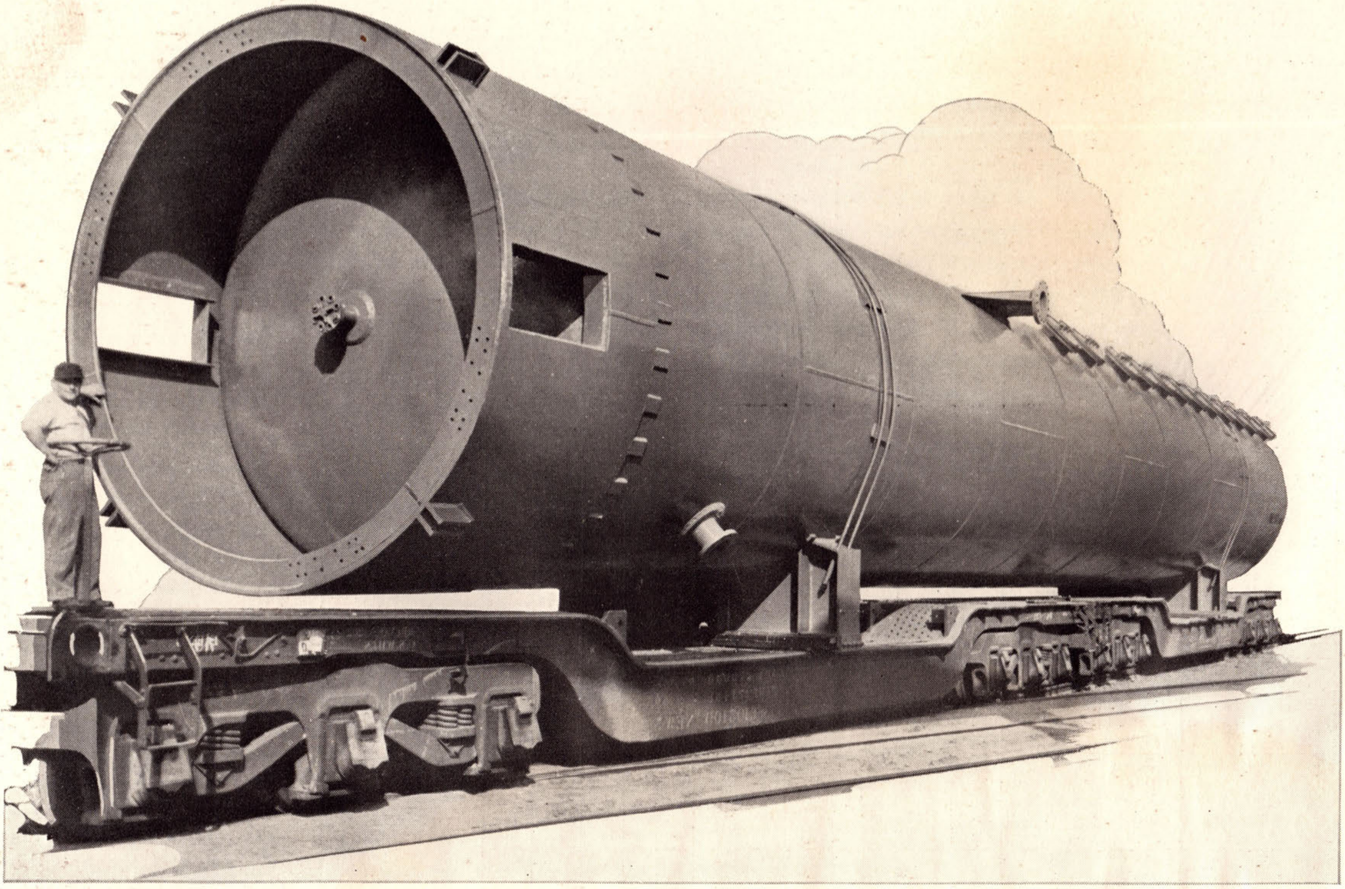
Process Equipment



Reaction chamber designed for 475 pounds pressure. Constructed of steel plate 3" thick, this vessel was stress relieved, x-rayed, and tested to 1850 pounds pressure

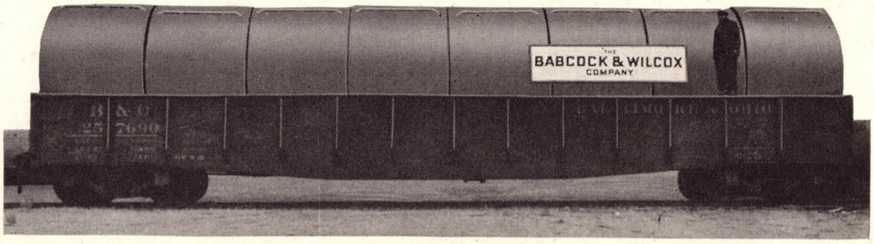
Process equipment manufactured by The Babcock & Wilcox Company includes pressure vessels, drums, castings, forgings, and tubular products, the application of which is indicated by the following list of typical products:

Vulcanizers
Penstock Piping
Cast Alloy Pipe Fittings
Heat and Corrosion Resisting Alloy Castings
Forged Return-Bend Fittings
Cast Return-Bend Fittings
Special Heat-Transfer Equipment
Gasoline Towers
Tar Stills
Oil Drums
Expansion Chambers
Accumulator Tanks
Reaction Chambers
Autoclaves
Evaporators
Vacuum Chambers
Digesters



Fusion-Welded Bubble Tower constructed of $1\frac{1}{4}$" steel plate to withstand 150 pounds per square inch pressure at 700 degrees fahrenheit maximum temperature. This tower is 12'-0" O. D., over 93' long, and weighs more than 325,000 pounds

Process Equipment

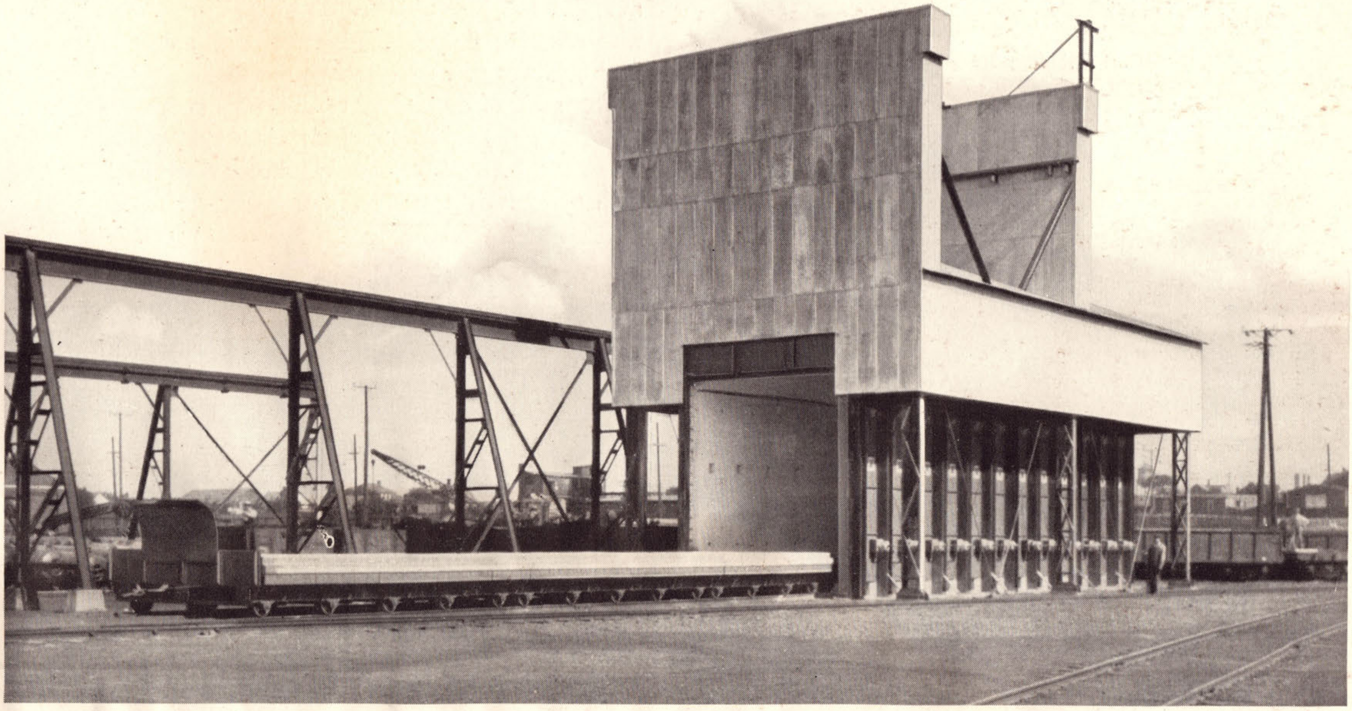


Tunnel lining sections 8'-9'' I. D., 7/8'' thick, and 6'-0'' long welded by the Babcock & Wilcox Fusion-Welding Technique

The Company has unexcelled shop facilities for the fabrication of vessels from carbon steel or the usual alloy steels, with riveted or welded seams, from plates of any thickness that can be formed, and in sizes limited only by railroad shipping clearances.

Pressure vessels are constructed with the same shop equipment and by the same methods used in the manufacture of Babcock & Wilcox boiler drums, which are noted for their excellence of workmanship.

Through a process developed exclusively by the Company, seams in welded vessels are produced which are equal to, or better than, the plate metal in tensile strength, shock resistance, ductility, and ability to withstand repeated stresses. Automatic machine welding, exploration of seams with 300,000-volt x-ray equipment, and stress-relieving in one of the largest furnaces ever constructed are important elements of this new and superior welding process.



Stress-relieving furnace at The Babcock & Wilcox Company's Barberton, Ohio, Works. This furnace is 14′-6″ wide, 14′-6″ to the spring of the arch, and 60′-0″ long

Castings

ALLOY CASTINGS

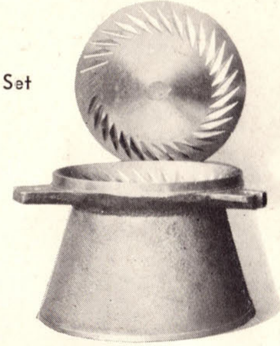
Castings of B & W Alloys are available in more than twenty standard analyses for meeting the most rigid requirements of resistance to corrosion, oxidation, high pressure, and high temperature. These alloys include such compositions as: B & W Alloy 600, which has extraordinary resistance to most forms of corrosion, has great strength without being subject to embrittlement at high temperatures, and remains ductile throughout the range of its permissible temperatures; B & W Alloy 650, which is especially adaptable to castings for sulphite paper mills because of its exceptional resistance to sulphite liquor; B & W Alloy 700, which has good resistance to corrosion and maximum resistance to oxidation at high temperatures, and can be used for continuous service up to 2000 degrees fahrenheit and in contact with carburizing mixtures; B & W Alloy 800, particularly useful where toughness and wear resistance under repeated heating and cooling, resistance to surface friction, impact, and pressure in contact with other metals at high temperatures are required; B & W Alloy 900, for chemical plant service at temperatures below 400 degrees fahrenheit—a corrosion-resisting alloy only; B & W Alloy 1100, capable of carrying heavy loads at temperatures up to 2000 degrees fahrenheit and of resisting oxidation at 2100 degrees fahrenheit; B & W Alloy 1500, an alloy that is notable for its ability to withstand high temperature, and especially for its usefulness where sulphur is present in amounts that would be destructive to other materials.

The available compositions also include Ni-Resist, which is useful wherever a material that is superior to cast iron in resistance to corrosion and high temperature is necessary and at reasonably low cost.

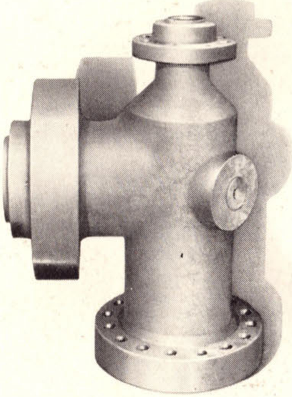
Special alloys can be made to any commercial specifications.

Castings of definite chemical composition, uniform machinability, and free from blow-holes, shrinkage cracks, and porosity are assured by the new production methods developed by this Company. The selection of raw materials and the determination of the chemical analysis of every charge is closely supervised by expert metallurgists, who also inspect finished castings and perform routine tests in a completely equipped chemical and physical laboratory. All melts are made in nine high-frequency electric-induction furnaces ranging in capacity from 100 to 3600 pounds. This method of melting secures accurate control over the chemical composition of every casting, and automatically refines each charge. No additions are made in the ladles—all melting is done in the furnaces, thus assuring thorough mixing of the alloying elements and castings of homogeneous metal.

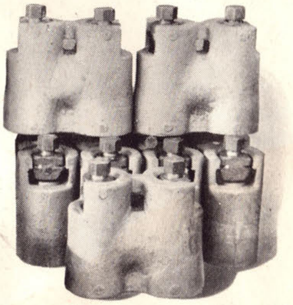
The staff of metallurgists is available for consultation regarding the selection of an alloy best suited for any given service, and for assuring the conformity of castings with purchasers' specifications.



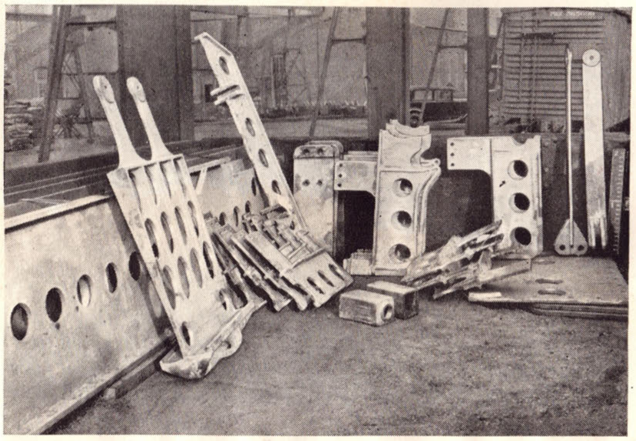
Cast Grinding Set



Cast Tee 10" by 4" for 455 pounds pressure at 1100 degrees fahrenheit. Weight, 1250 pounds



Oil-Still Return-Bend Castings for 1350 pounds pressure at 900 degrees fahrenheit. Tested at 4000 pounds pressure



Tube-Support Castings of B & W Alloy 661

Castings

ELVERITE

Elverite, a chilled-cast-iron product, is widely used in the reduction and pulverization of rock products, cement clinker, ores, and other highly abrasive materials. It is unexcelled for long life in this service.

Parts commonly made of Elverite are: balls and grinding rings for pulverizers; linings for tube mills; slugger plates or segments, and roll shells for roller mills; cone-heads and concaves for gyratory crushers; sprocket and traction wheels; and conveyor gudgeons and bearings.

Elverite is cast of *pure* cold-blast charcoal iron with the mixtures varied chemically to obtain a chilled section of 1/8 in. to 2½ in. in depth depending on the shape and use of the casting. The chilled section is backed by a machinable section of gray iron, which gives the casting strength and resistance to shock.

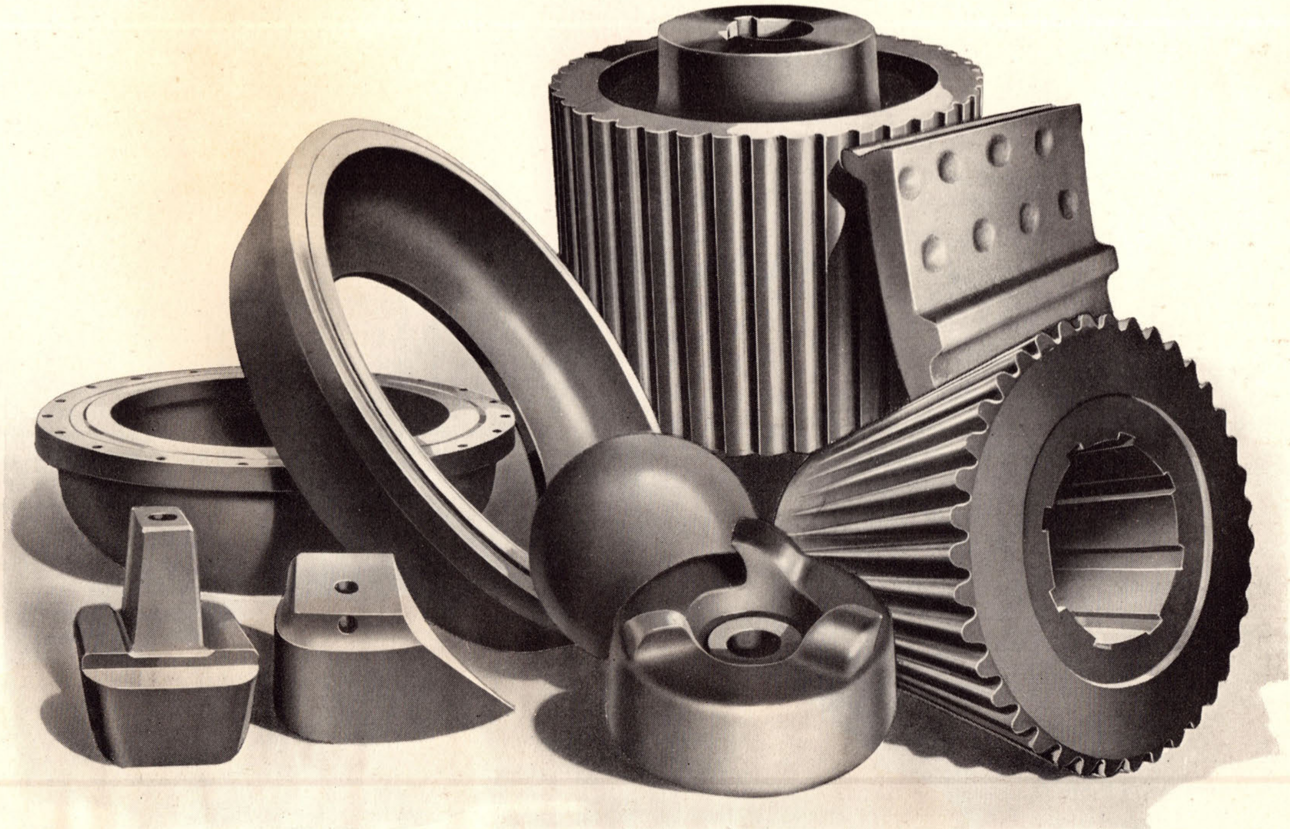
Elverite has a hardness of 525 to 700 Brinell.

ADAMANTINE

Adamantine is a superior grade of manganese-chromium steel available in cast or forged shapes for service where abrasion resistance, great strength, and machinability of wearing surfaces are required. It differs from ordinary steels in its toughness, and resistance to deformation when subjected to frictional heating or repeated hammering.

Adamantine has a hardness of approximately 300 to 500 Brinell.

All Adamantine for castings and forgings is produced in high-frequency electric induction furnaces. The chemical composition and production conditions are thereby accurately controlled.



Group of pulverizer parts cast of Elverite and Adamantine

Mercury-Vapor Heat-Transfer Systems

For processes requiring precise temperature control, the Company is prepared to supply complete equipment for mercury-vapor heat-transfer systems possessing unusual features of design and operation. In producing this equipment, the Company applies the skill and experience gained in establishing its premier position in the manufacture of steam boilers, and the knowledge resulting from its extensive research work on mercury boilers.

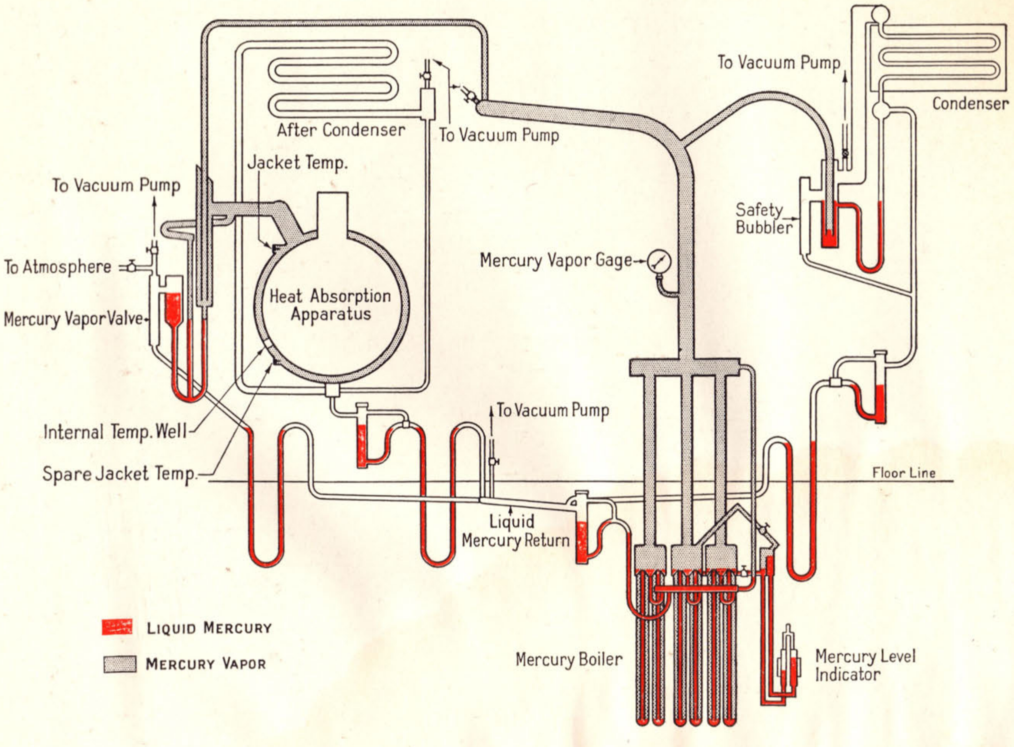
The systems offered are applicable particularly to heating, cooling, and temperature control in the heavy-chemical, petroleum, varnish, dyestuffs, pharmaceutical, foodstuffs, vegetable-oil, and similar industries.

Process heating by means of steam has numerous advantages, which have made it standard within the limits of the temperatures obtainable from the steam pressure needed for power purposes in individual plants. When a process requires temperatures higher than those obtainable with steam, or, when other factors necessitate a separate source of heat, mercury vapor should be considered. The high rate of heat transfer obtainable with mercury results in extremely high rates of heat input with a small amount of heating surface, and with a relatively small quantity of mercury in the system. Mercury-vapor systems can be operated much more easily than steam systems, and can be fully automatic, and in comparison with other methods of heat transfer at high temperatures, offer the advantage of requiring no pumps and no make-up.

Briefly, mercury as a heat-transfer medium has the following advantages:

1. The system lends itself to exact temperature control.
2. Its temperature range is 350 to 1000 deg. fahr.
3. As it is an element, mercury does not dissociate; therefore, prevents fouling of heat-transfer surfaces.
4. The high specific gravity of the liquid makes gravity return possible under operating conditions found in most chemical plants.
5. Fire hazards are eliminated, as mercury vapor is non-inflammable.
6. Mercury-vapor systems may be easily applied to many types of existing apparatus.
7. Cast iron and steel, the most common and the cheapest metals, are not affected by mercury or its vapor.
8. Mercury freezes at—39 deg. cent. (—38 deg. fahr.) eliminating practically all freezing hazards and thawing accessories.
9. Mercury systems are flexible—quick pick-up.

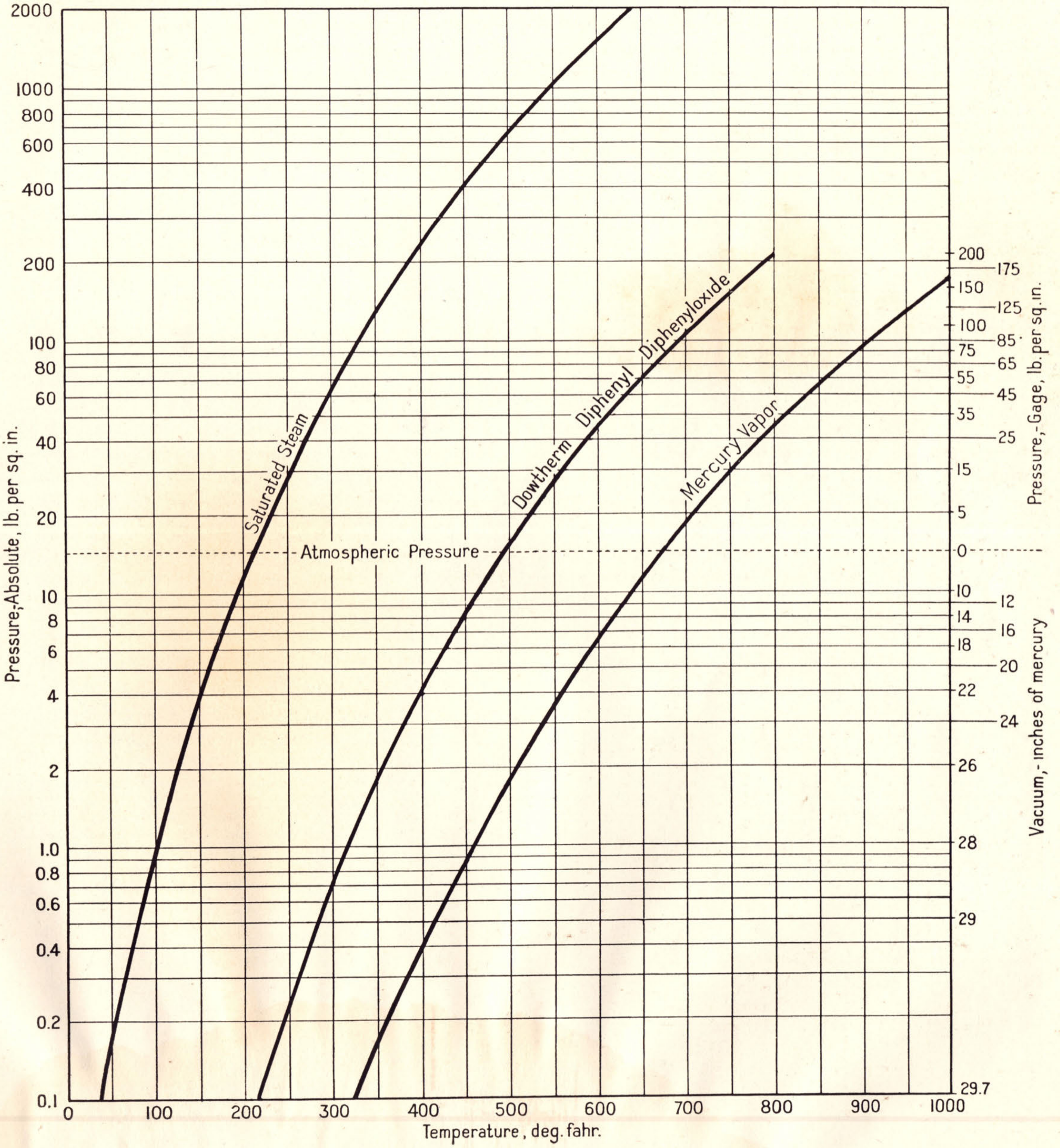
The foregoing advantages result in heating, cooling, and temperature-control systems that provide effective temperature control from 350 to 1000 deg. fahr. with low maintenance and operating cost. Mercury-vapor systems can use any source of heat: oil, gas, coal, or electricity.



Typical arrangement of a Babcock & Wilcox Mercury Boiler and heat-absorption apparatus. While this system is designed to operate at pressures below atmospheric it may be used, with changes in a few dimensions, at pressures above the atmosphere.

The safety bubbler acts as a safety valve, permitting high-pressure vapor to pass to the condenser from whence it is returned in the liquid state to the boiler. By alternately opening and closing the mercury-vapor valve (which can be done automatically), the system may be operated with a higher pressure in the vapor mains than in the heat absorption apparatus

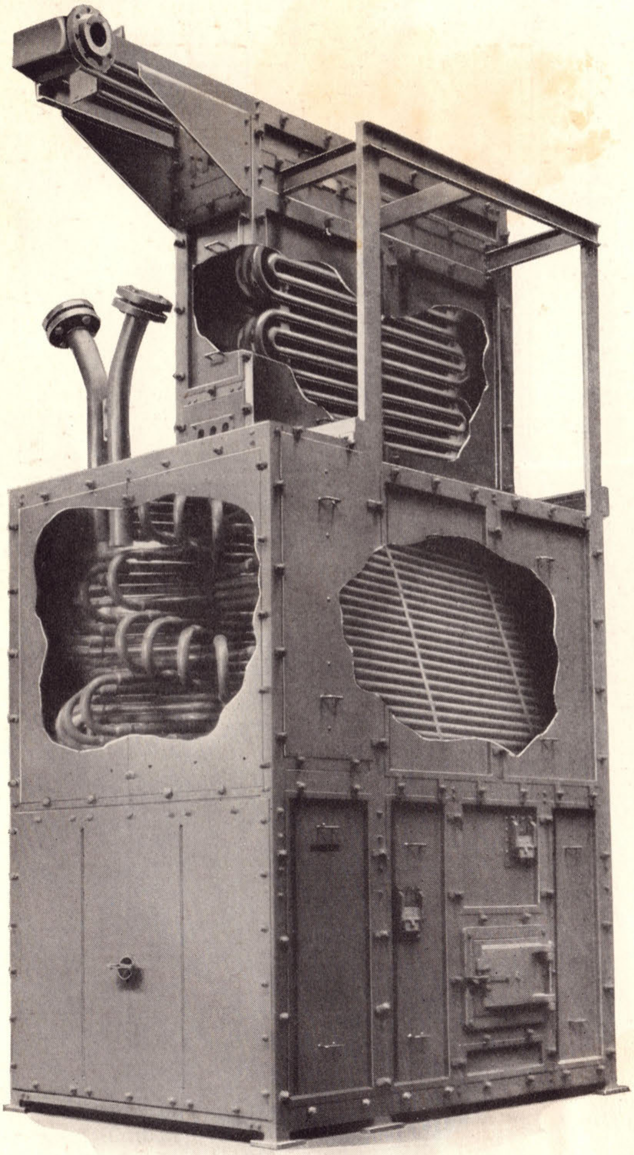
Mercury-Vapor Heat-Transfer Systems



Graph showing pressure-temperature relations of saturated steam, diphenyl and diphenyloxide, and mercury vapor

Diphenyl and Diphenyloxide Heat-Transfer Systems

Diphenyl, diphenyloxide, and Dowtherm, having thermodynamic properties intermediate between saturated steam and mercury, are becoming increasingly prominent for heat-exchange processes. The Babcock & Wilcox Company, in line with its policy of anticipating the demands for such apparatus, is now prepared to supply complete equipment for processes using these liquids for heat transfer.



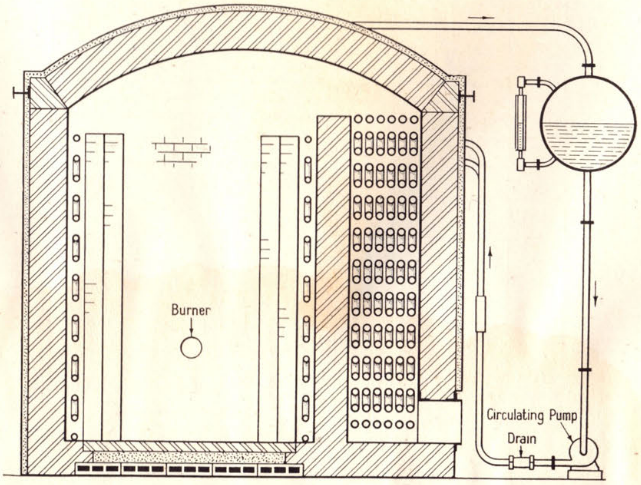
Steel-cased Babcock & Wilcox Boiler for operation with Diphenyl
The same construction would be used for Diphenyloxide

The advantages of these heat-transfer mediums in general are:

1. They permit constant temperature operation at moderately high temperatures (approximately 450 to 750 deg. fahr.) with pressures less than 150 lbs. per sq. in.
2. They are non-corrosive.
3. They can be obtained in large quantities at a cost that will permit their extensive use.
4. Tests show that the coefficient of heat transfer for boiling diphenyl is sufficiently high for commercial use if the apparatus is properly designed.

The accompanying illustrations show typical Babcock & Wilcox boilers for use with diphenyl, diphenyloxide, or Dowtherm. The unit shown at the left is a steel-cased boiler of the forced-flow recirculation type, designed and built to supply diphenyl vapor at 144 lbs. per sq. in. gage pressure and 750 deg. fahr. The liquid is taken from the separating drum by the circulating pump and forced through the convection tubes and then through the furnace tubes and back to the separating drum. Here, the vapor separates from the liquid, the liquid repeating the cycle and the vapor passing to the heat exchangers. A noteworthy feature of this boiler is the furnace radiation chamber, which is designed to insure uniform heat absorption by the furnace tubes.

The figure below shows a schematic diagram of a brick-set unit for small capacities and is particularly adapted to small industrial plants where head room is limited. The circulation is the same as that in the steel-cased unit.



Brick-set Babcock & Wilcox Diphenyl Boiler

Automatic Sulphite-Cooking Process

The greatest advance made during recent years in sulphite cooking for pulp mills is represented by the automatic process herewith described. This process improves the quality of the pulp, raises the pulp yield, increases the output of the digester; and reduces the consumption of sulphur, lime, and steam. Briefly, it produces more and better pulp for less money than is possible by the usual methods.

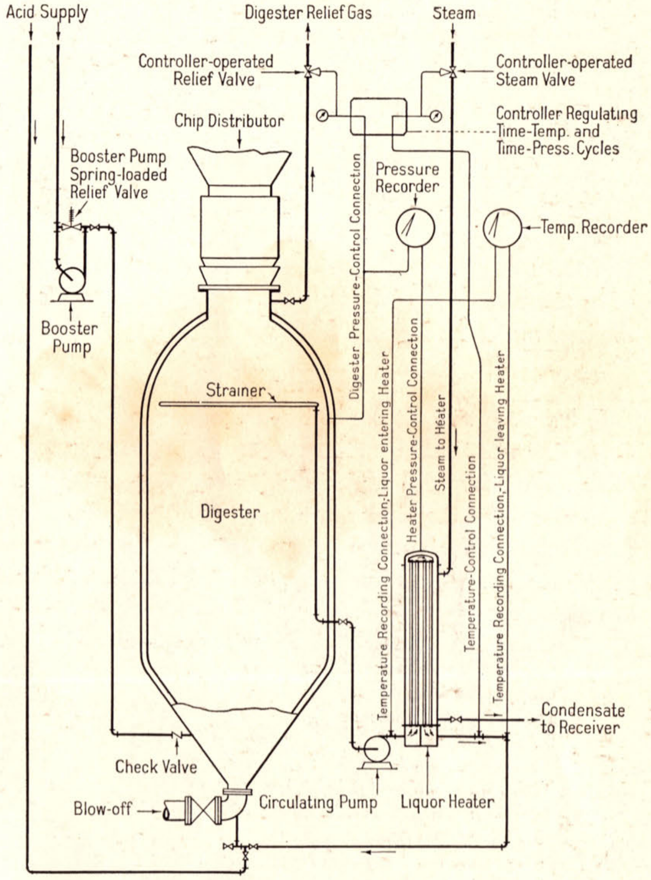
It can be used with existing digesters, the results being the same as with new installations.

In this process, scientific automatic control is used to govern the pressure, temperature, and time variables in the cooking cycle, in place of the usual manual control, which manual control depends wholly upon the uncertainties of the human factor. The cooking liquor is pumped from the upper zone of the digester, through an external heater, and thence to the bottom of the digester, resulting in positive and definitely controllable circulation. The control system automatically regulates the flow of steam to the heater, in order to maintain the desired temperature of liquor delivered to the digester, and, through regulation of the relief valve, governs the pressure within the digester. Both the pressure and temperature may be held constant automatically, or raised and lowered at any desired rate throughout the entire cooking cycle. Thus a definite cooking schedule can be maintained with pressure, temperature, and time variables under perfect control.

An important part of the equipment furnished with this system is the chip feeder, a patented device which, by preventing the formation of concentrating channels of acid flow through the digester, promotes uniform temperature throughout each horizontal plane in the digester. Thus, the maximum temperature required is reduced, and the time needed to reach equilibrium of temperature throughout the digester is materially shortened. The inequalities of temperature which, in the usual system, result in zones of either severely overcooked or undercooked pulp are entirely eliminated, resulting in higher quality of product and substantially increased yield.

The method of feeding and distributing the chips also increases the charge, thus raising the output of the digester.

The foregoing statements concerning this system are based on actual operating results obtained with this process in the Kimberly Mill of the Kimberly-Clark Corporation, Kimberly, Wisconsin, where one 15 x 35 ft. digester was operated experimentally for over 15 months. Since that time, all six digesters in the mill have been operated by this process for over six months in routine mill practice.


Acid Supply
Digester Relief Gas
Steam
Controller-operated Relief Valve
Controller-operated Steam Valve
Chip Distributor
Controller Regulating Time-Temp. and Time-Press. Cycles
Booster Pump Spring-loaded Relief Valve
Pressure Recorder
Temp. Recorder
Digester Pressure-Control Connection
Booster Pump
Strainer
Temperature Recording Connection,-Liquor entering Heater
Heater Pressure-Control Connection
Steam to Heater
Temperature-Control Connection
Temperature Recording Connection,-Liquor leaving Heater
Digester
Condensate to Receiver
Check Valve
Blow-off
Circulating Pump
Liquor Heater

Specific data on the test results show:

1. An appreciable improvement in the physical properties of the pulp, for any given bleachability. The Mullen Test, both initial and maximum, was raised from 7 to 10 per cent.
2. A definite increase in the yield of pulp per unit of wood as compared to that of runs without the system, under similar conditions. For the same bleachability, the increase was normally 5 per cent.
3. An increase in the digester yield of 12 per cent, due in part to the above increase in pulp yield and the chip feeder.
4. A reduction in sulphur and lime consumption of about 12 per cent.
5. Appreciably lower steam consumption. Steam delivered to the digester was reduced about 10 per cent, while heat in the condensate returned to the boiler room represented another 10 per cent. Total steam saving—20 per cent.

The Babcock & Wilcox Company is prepared to design and supply all equipment necessary for the installation of this process. The Company has unexcelled facilities for producing the special alloy piping, heater, and other liquor-handling equipment and is prepared to furnish, in collaboration with the Kimberly-Clark Corporation, engineering service and operating data based on the invaluable information obtained from the experience of that organization.

Seamless Pipe and Tubing

The Babcock & Wilcox Tube Company operates the country's largest specialty tube-mill wherein each order receives individual attention as contrasted with the quantity production of staple-tonnage products with volume of output necessarily taking precedence over quality.

The Company maintains a well-equipped physical, chemical and metallurgical laboratory and a dual staff of metallurgists; one to control manufacturing operations, and the other to conduct research work and assist users of its products in the selection and application of tubes of the best materials for various services.

MATERIALS

In keeping with its specialty-mill operating-policy the Company was the first in this country to produce seamless alloy tubing for heat and corrosion resisting service and continues to be the leader in the developing of new alloys and materials for various applications. Among the more widely used materials from which B & W Tubular Products are made are:

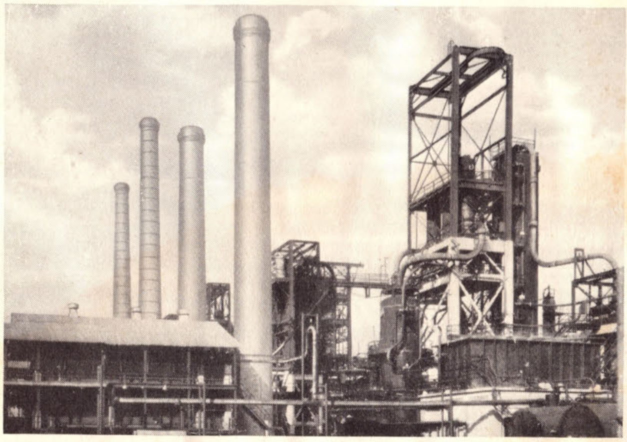
Carbon Steel (Boiler Code and higher-carbon steels)
Carbon Molybdenum Steel
Copper Bearing Steel
Toncan Iron (Tubes only)
S.A.E. Alloys
18% Chromium Alloy
18% Chromium 8% Nickel Alloy
18% Chromium 8% Nickel Low Carbon Alloy
5% Chromium Alloy
5% Chromium Alloy with Molybdenum
5% Chromium Alloy with Tungsten

BOILER AND LOCOMOTIVE TUBES

Babcock & Wilcox Seamless Boiler Tubes have been the standard for the principal stationary, marine, and locomotive boilers for over 25 years. In this period more than 300,000,000 linear feet of B & W Tubes have been installed in boilers built to operate at pressures up to 1400 lbs. for power plant service and to 3500 lbs. for experimental purposes.

STILL TUBES

The Company is the leading maker of still tubes in the United States, producing, in proportion to its capacity, a greater tonnage of still tubes than any other manufacturer. These tubes are used in stills handling a wide range of crude oils under a great variety of operating conditions.



MECHANICAL TUBING

Mechanical Tubing is made for:

- Condensers
- Heat Exchangers
- Refrigerating Apparatus
- Air-Conditioning Apparatus
- Structural Uses

It is also used in large quantities in the leading makes of automobiles for such vital parts as tubular axles, drag links, propeller shafts, tie rods, and roller bearings.

SEAMLESS PIPE

Because seamless pipe is in reality seamless tubing made in iron pipe sizes (to permit the use of standard pipe fittings), only the highest quality of billet stock may be used; inferior materials will not withstand the rigorous treatment necessitated by the piercing process. The finished product is, therefore, bound to be superior to welded pipe, and this inherent excellence is further enhanced by the high standards to which all B & W products are made under the Company's specialty-mill operating-policy. As a result, B & W Seamless Pipe is produced to closer tolerances, has a finer finish, and possesses other desirable characteristics to a degree not found hitherto in this class of material.

SIZES

Babcock & Wilcox Seamless Tubing is made hot-finished and cold-drawn in sizes from ½ to 8⅝ in. O.D. Seamless pipe is made in standard, extra strong, and double extra strong weights in sizes from ½ in. to 8 in. I.P.S.

The Company's ability to furnish hot-finished seamless pipe and tubing in sizes as small as 1 in. O.D. (or ¾ in. I.P.S.) provides users of its products an opportunity to effect substantial savings for many applications, where formerly only cold drawn material has been available. These products, termed Diescherized Pipe & Tubing, are made possible by the new and remarkable Diescher Mill employing an entirely new method of seamless tube manufacture, resulting in hot-finished products of fine finish and to tolerances which, for practical purposes, are as satisfactory as those of cold-drawn tubing.

Complete Repair Service

Accurate records of even the earliest boilers, built more than fifty years ago, enable the Company to supply repair parts which are duplicates of those originally used in the construction of the boilers. These parts are guaranteed as to quality of material, accuracy of workmanship, and satisfaction in service. The purchase of genuine B & W parts, therefore, assures a degree of security never realized with repair parts fabricated by jobbing shops.

An organization of experienced installation and repair men is maintained by the Company in order that it may render the service to which its customers are entitled, and in order that the Company may assume the responsibility for repairs made by it. This staff is so located that competent mechanics, fully equipped with all necessary tools, can be sent to any point on short notice.

A partial list of parts and materials which can be shipped from stock or manufactured on short notice follows:

Baffles: Refractory, Cast Iron, and Wrought Steel.

Bailey Furnace Parts: Blocks, Tubes, Headers, and Heat-Conducting Bond.

Boxes: Stoker and Water.

Brick: Standard and Special Shapes of Firebrick, and Insulating Firebrick.

Buckstays.

Burner Parts: Gas, Oil, and Pulverized-Coal.

Castings: Iron, Steel, Heat-Resisting.

Dampers.

Doors: Ash, Cleaning, Fire, Inspection, Stoker, and Tube.

Drier Parts: Gears, Pinions, Seal Rings, and Lifting Vanes.

Drums: Boiler and Special.

Economizer Parts.

Exhauster Parts: Blades, Shafts, and Liners.

Feeder Parts: Bailey and Screw Types.

Fittings.

Fronts: Boiler.

Furnace Materials.

Gage Cocks.

Gaskets.

Grates.

Handhole Fittings.

Headers.

Hose: Steam Lance, Turbine Cleaner, and Air.

Manhole Fittings.

Oil Burner Parts.

Pipes: Cross and Dry.

Pulverized-Coal Burner Parts.

Pulverizer Parts: Balls, Yokes, Pushers, Grinding Rings, and Shafts.

Pump Parts: Fuller-Kinyon.

Stoker Parts.

Superheater Parts.

Suspensions.

Tile.

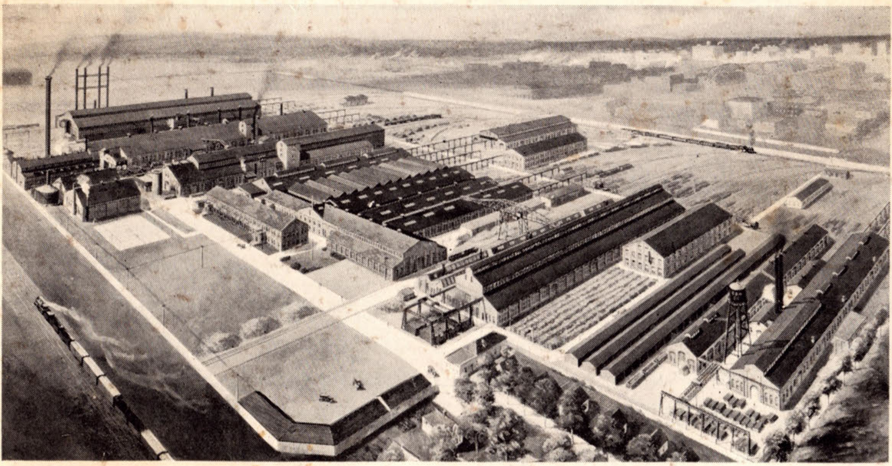
Tools: Expanders, Cutters, Cleaners, Fire, and Special.

Tubes.

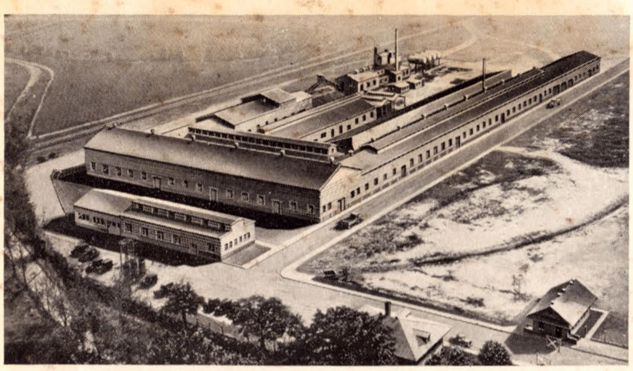
Valves.

Water-Gage Cocks.

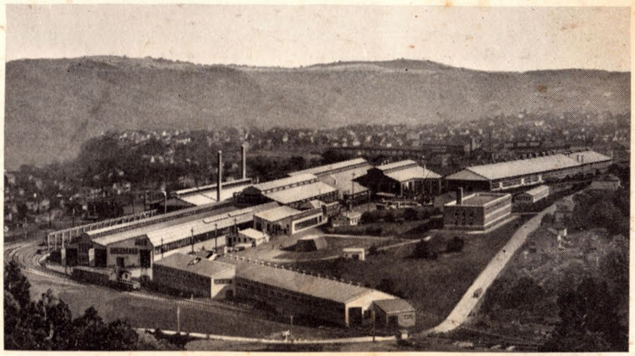
Water Columns.



The Babcock & Wilcox Company's Barberton, Ohio, Works



The Babcock & Wilcox Company's Augusta, Ga., Works



The Babcock & Wilcox Tube Company's Beaver Falls, Pa., Works

THE BABCOCK & WILCOX COMPANY

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PITTSBURGH, PA. .... Koppers Bldg.
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TULSA, OKLA. .... Philtower Bldg.
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HAVANA, CUBA .... Calle de Aguiar 104
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